Professional Digital Two-Way Radio System &
SMARTNET® and Privacy Plus™ Trunked Portable Radios

MOTOTRBO™ Portable

Detailed Service Manual

XPR™ 6380 Non Display Portable

XPR™ 6580 Display Portable

MOTOROLA

Foreword

This manual covers all models of the XPR series Portable Radios, unless otherwise specified. It includes all the information necessary to maintain peak product performance and maximum working time, using levels 1 and 2 maintenance procedures. This level of service goes down to the board replacement level and is typical of some local service centers, Motorola Authorized Dealers, self-maintained customers, and distributors.

Product Safety and RF Exposure Compliance

Before using this product, read the operating instructions for safe usage contained in the Product Safety and RF Exposure booklet enclosed with your radio.

ATTENTION!

This radio is restricted to occupational use only to satisfy FCC RF energy exposure requirements. Before using this product, read the RF energy awareness information and operating instructions in the Product Safety and RF Exposure booklet enclosed with your radio (Motorola Publication part number 6881095C98) to ensure compliance with RF energy exposure limits.

For a list of Motorola-approved antennas, batteries, and other accessories, visit the following web site which lists approved accessories:http://www.motorola.com/governmentandenterprise

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Document History

The following major changes have been implemented in this manual since the previous edition:

Edition	Description	Date
68009273001-A	Initial Release 800/900 Band information	Jun. 2009

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Related Publications

IMPRES Adaptive Single-Unit Charger User Manual 6816787H01
IMPRES Adaptive Multi-Unit Charger User Manual.....6816789H01
IMPRES Adaptive Multi-Unit Charger Service Manual 6871357L01
Remote Speaker Microphone User Manual..... 6871003L01
IMPRES Remote Speaker Microphone User Manual 6871004L01
Factory Mutual Approval Manual 6871532L01
*MOTOTRBO™ Portable User Guide CD .....HKLN4282_

*CD consists of:
XPR™ 6300/6350 User Guide
XPR™ 6300/6350 Quick Reference Card
XPR™ 6500/6550 User Guide
XPR™ 6500/6550 Quick Reference Card
Safety Leaflet

Commercial Warranty

Limited Warranty

MOTOROLA COMMUNICATION PRODUCTS

I. What This Warranty Covers And For How Long

MOTOROLA INC. (“MOTOROLA”) warrants the MOTOROLA manufactured Communication Products listed below (“Product”) against defects in material and workmanship under normal use and service for a period of time from the date of purchase as scheduled below:

XPR Series Digital Portable Radios	Two (2) Years
Product Accessories (Excluding Batteries and Chargers)	One (1) Year

The portables additionally ship with a standard 1-year Repair Service Advantage (RSA) (for U.S. customers) or 1-year Extended Warranty (for Canada customers). However, at the time of order, you may choose to omit these warranties. For more RSA or Extended Warranty information, please refer to the portable price pages or Motorola Online (https://businessonline.motorola.com) > Resource Center > Services > Service Product Offerings > Repair Service Advantage or Extended Warranty.

Motorola, at its option, will at no charge either repair the Product (with new or reconditioned parts), replace it (with a new or reconditioned Product), or refund the purchase price of the Product during the warranty period provided it is returned in accordance with the terms of this warranty. Replaced parts or boards are warranted for the balance of the original applicable warranty period. All replaced parts of Product shall become the property of MOTOROLA.

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MOTOROLA cannot be responsible in any way for any ancillary equipment not furnished by MOTOROLA which is attached to or used in connection with the Product, or for operation of the Product with any ancillary equipment, and all such equipment is expressly excluded from this warranty. Because each system which may use the Product is unique, MOTOROLA disclaims liability for range, coverage, or operation of the system as a whole under this warranty.

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This warranty gives specific legal rights, and there may be other rights which may vary from state to state.

IV. How To Get Warranty Service

You must provide proof of purchase (bearing the date of purchase and Product item serial number) in order to receive warranty service and, also, deliver or send the Product item, transportation and insurance prepaid, to an authorized warranty service location. Warranty service will be provided by Motorola through one of its authorized warranty service locations. If you first contact the company which sold you the Product, it can facilitate your obtaining warranty service. You can also call Motorola at 1-800-927-2744 US/Canada.

V. What This Warranty Does Not Cover

A. Defects or damage resulting from use of the Product in other than its normal and customary manner.

B. Defects or damage from misuse, accident, water, or neglect.

C. Defects or damage from improper testing, operation, maintenance, installation, alteration, modification, or adjustment.

D. Breakage or damage to antennas unless caused directly by defects in material workmanship.

E. A Product subjected to unauthorized Product modifications, disassemblies or repairs (including, without limitation, the addition to the Product of non-Motorola supplied equipment) which adversely affect performance of the Product or interfere with Motorola's normal warranty inspection and testing of the Product to verify any warranty claim.

F. Product which has had the serial number removed or made illegible.

G. Rechargeable batteries if:

- any of the seals on the battery enclosure of cells are broken or show evidence of tampering.
- the damage or defect is caused by charging or using the battery in equipment or service other than the Product for which it is specified.

H. Freight costs to the repair depot.

I. A Product which, due to illegal or unauthorized alteration of the software/firmware in the Product, does not function in accordance with MOTOROLA's published specifications or the FCC type acceptance labeling in effect for the Product at the time the Product was initially distributed from MOTOROLA.

J. Scratches or other cosmetic damage to Product surfaces that does not affect the operation of the Product.

K. Normal and customary wear and tear.

VI. Patent And Software Provisions

MOTOROLA will defend, at its own expense, any suit brought against the end user purchaser to the extent that it is based on a claim that the Product or parts infringe a United States patent, and MOTOROLA will pay those costs and damages finally awarded against the end user purchaser in any such suit which are attributable to any such claim, but such defense and payments are conditioned on the following:

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B. that MOTOROLA will have sole control of the defense of such suit and all negotiations for its settlement or compromise; and

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VII. Governing Law

This Warranty is governed by the laws of the State of Illinois, USA.

Battery and Charger Warranty

Workmanship Warranty

The workmanship warranty guarantees against defects in workmanship under normal use and service.

All MOTOTRBO Batteries	Two (2) Years
IMPRES Chargers (Single-Unit and Multi-Unit, Non-Display)	Two (2) Years
IMPRES Chargers (Multi-Unit with Display)	One (1) Year

Capacity Warranty

The capacity warranty guarantees 80% of the rated capacity for the warranty duration.

Nickel Metal-Hydride (NiMH) or Lithium-Ion (Li-Ion) Batteries	12 Months
IMPRES Batteries, When Used Exclusively with IMPRES Chargers	18 Months

Section 1

INTRODUCTION

1.0 Notations Used in This Manual

Throughout the text in this publication, you will notice the use of note and caution notations. These notations are used to emphasize that safety hazards exist, and due care must be taken and observed.

NOTE: An operational procedure, practice, or condition that is essential to emphasize.

Caution

CAUTION indicates a potentially hazardous situation which, if not avoided, might result in equipment damage.

2.0 Radio Description

The XPR series portable radios are available in the following frequency ranges and power levels.

Table 1-1. Radio Frequency Ranges and Power Levels

Frequency Band	Bandwidth	Power Level
800/900 RX/TX Talk around	851-870MHz 935-941MHz	1 Watt or 2.5 Watt
800/900 TX Trunking	806-825MHz 896-902MHz	1 Watt or 2.5 Watt

These radios are among the most sophisticated two-way radios available. They have a robust design for radio users who need high performance, quality, and reliability in their daily communications. This architecture provides the capability of supporting a multitude of legacy and advanced features resulting in a more cost-effective two-way radio communications solution.

Notes

Section 2

MAINTENANCE

1.0 Introduction

This chapter provides details about the following

- Preventive maintenance (inspection and cleaning).
- Safe handling of CMOS and LDMOS devices.
- Repair procedures and techniques

2.0 Preventive Maintenance

Periodic visual inspection and cleaning is recommended.

2.1 Inspection

Check that the external surfaces of the radio are clean, and that all external controls and switches are functional. It is not recommended to inspect the interior electronic circuitry.

2.2 Cleaning Procedures

The following procedures describe the recommended cleaning agents and the methods to be used when cleaning the external and internal surfaces of the radio. External surfaces include the front cover, housing assembly and battery case. These surfaces should be cleaned whenever a periodic visual inspection reveals the presence of smudges, grease, and/or grime.

NOTE Internal surfaces should be cleaned only when the radio is disassembled for service or repair.

The only recommended agent for cleaning the external radio surfaces is a 0.5% solution of a mild dishwashing detergent in water. The only factory recommended liquid for cleaning the printed circuit boards and their components is isopropyl alcohol (100% by volume).

Caution

The effects of certain chemicals and their vapors can have harmful results on certain plastics. Avoid using aerosol sprays, tuner cleaners and other chemicals.

Cleaning External Plastic Surfaces

Apply the 0.5% detergent-water solution sparingly with a stiff, non-metallic, short-bristled brush to work all loose dirt away from the radio. Use a soft, absorbent, lintless cloth or tissue to remove the

solution and dry the radio. Make sure that no water remains entrapped near the connectors, cracks, or crevices.

Cleaning Internal Circuit Boards and Components

Isopropyl alcohol (100%) may be applied with a stiff, non-metallic, short-bristled brush to dislodge embedded or caked materials located in hard-to-reach areas. The brush stroke should direct the dislodged material out and away from the inside of the radio. Make sure that controls or tunable components are not soaked with alcohol. Do not use high-pressure air to hasten the drying process since this could cause the liquid to collect in unwanted places. After completing of the cleaning process, use a soft, absorbent, lintless cloth to dry the area. Do not brush or apply any isopropyl alcohol to the frame, front cover or back cover.

NOTE Always use a fresh supply of alcohol and a clean container to prevent contamination by dissolved material (from previous usage).

2.3 Safe Handling of CMOS and LDMOS Devices

Complementary metal-oxide semiconductor (CMOS) devices are used in this family of radios, and are susceptible to damage by electrostatic or high voltage charges. Damage can be latent, resulting in failures occurring weeks or months later. Therefore, special precautions must be taken to prevent device damage during disassembly, troubleshooting, and repair.

Handling precautions are mandatory for CMOS circuits and are especially important in low humidity conditions.

DO NOT attempt to disassemble the radio without first referring to the following CAUTION statement.

Caution

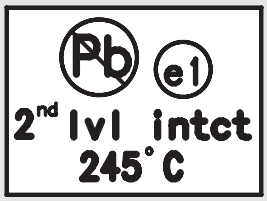
This radio contains static-sensitive devices. Do not open the radio unless you are properly grounded. Take the following precautions when working on this unit:

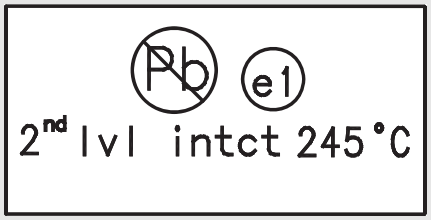
- Store and transport all CMOS devices in conductive material so that all exposed leads are shorted together. Do not insert CMOS devices into conventional plastic “snow” trays used for storage and transportation of other semiconductor devices.
- Ground the working surface of the service bench to protect the CMOS device. We recommend using a wrist strap, two ground cords, a table mat, and a floor mat.
- Wear a conductive wrist strap in series with a 100k resistor to ground. (Replacement wrist straps that connect to the bench top covering are Motorola part number 4280385A59).
- Do not wear nylon clothing while handling CMOS devices.
- Do not insert or remove CMOS devices with power applied. Check all power supplies used for testing CMOS devices to be certain that there are no voltage transients present.
- When straightening CMOS pins, provide ground straps for the apparatus used.
- When soldering, use a grounded soldering iron.
- If at all possible, handle CMOS devices by the package and not by the leads. Prior to touching the unit, touch an electrical ground to remove any static charge that you may have accumulated. The package and substrate may be electrically common. If so, the reaction of a discharge to the case would cause the same damage as touching the leads.
- This radio also contain static sensitive GaAs RF switches. These devices should be handled with the same precaution as CMOS devices.

NOTE Replace with dust cover when the universal connector is not in use.

3.0 Repair Procedures and Techniques — General

NOTE Environmentally Preferred Products (EPP) (refer to the marking on the printed circuit boards — examples shown below) were developed and assembled using environmentally preferred components and solder assembly techniques to comply with the European Union's **Restriction of Hazardous Substances (ROHS) Directive 2002/95/EC** and **Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC**. To maintain product compliance and reliability, use only the Motorola specified parts in this manual.





Any rework or repair on Environmentally Preferred Products must be done using the appropriate lead-free solder wire and lead-free solder paste as stated in the following table:

Table 2-2. Lead Free Solder Wire Part Number List

Motorola Part Number	Alloy	Flux Type	Flux Content by Weight	Melting Point	Supplier Part number	Diameter	Weight
1088929Y01	95.5Sn/3.8Ag/0.7Cu	RMA Version	2.7-3.2%	217C	52171	0.015"	1lb spool

Table 2-3. Lead Free Solder Paste Part Number List

Motorola Part Number	Manufacturer Part Number	Viscosity	Type	Composition & Percent Metal	Liquid Temperature
1085674C03	NC-SMQ230	900-1000KCPs Brookfield (5rpm)	Type 3 (-325/+500)	(95.5%Sn-3.8%Ag-0.7%Cu) 89.3%	217°C

Parts Replacement and Substitution

When damaged parts are replaced, identical parts should be used. If the identical replacement part is not locally available, check the parts list for the proper Motorola part number and order the part from the nearest Motorola Radio Products and Solutions Organization (RPSO) listed in Appendix A of this manual.

Rigid Circuit Boards

The family of radios uses bonded, multi-layer, printed circuit boards. Since the inner layers are not accessible, some special considerations are required when soldering and unsoldering components. The printed through holes may interconnect multiple layers of the printed circuit. Therefore, exercise care to avoid pulling the plated circuit out of the hole.

When soldering near connector:

- Avoid accidentally getting solder in the connector.
- Be careful not to form solder bridges between the connector pins.
- Examine your work closely for shorts due to solder bridges.

Chip Components

Use the RLN4062 Hot-Air Repair Station for chip component replacement. Adjust the temperature control to 370°C (700°F), and adjust the airflow to a minimum setting. Airflow can vary due to component density.

- **To remove a chip component**:

1. Use a hot-air hand piece and position the nozzle of the hand piece approximately 0.3 cm (1/8") above the component to be removed.
2. Begin applying the hot air. Once the solder reflows, remove the component using a pair of tweezers.
3. Using a solder wick and a soldering iron or a power desoldering station, remove the excess solder from the pads.

- **To replace a chip component using a soldering iron**:

1. Select the appropriate micro-tipped soldering iron and apply fresh solder to one of the solder pads.
2. Using a pair of tweezers, position the new chip component in place while heating the fresh solder.
3. Once solder wicks onto the new component, remove the heat from the solder.
4. Heat the remaining pad with the soldering iron and apply solder until it wicks to the component. If necessary, touch up the first side. All solder joints should be smooth and shiny.

- **To replace a chip component using hot air**:

1. Use the hot-air hand piece and reflow the solder on the solder pads to smooth it.
2. Apply a drop of solder paste flux to each pad.
3. Using a pair of tweezers, position the new component in place.
4. Position the hot-air hand piece approximately 0.3 cm (1/8”) above the component and begin applying heat.
5. Once the solder wicks to the component, remove the heat and inspect the repair. All joints should be smooth and shiny.

4.0 Notes For All Schematics and Circuit Boards

* Component is frequency sensitive. Refer to the Electrical Parts List for value and usage.

1. Unless otherwise stated, resistances are in Ohms (k = 1000), and capacitances are in picofarads (pF) or microfarads (µF).

2. DC voltages are measured from point indicated to chassis ground using a Motorola DC multimeter or equivalent. Transmitter measurements should be made with a 1.2 µH choke in series with the voltage probe to prevent circuit loading.

3. Reference Designators are assigned in the following manner:

700/900 Series	=	Transmitter
000/200 Series	=	Frequency Generation
400/600 Series	=	Receiver
1000/2000/3000 Series	=	Controller
6000 Series	=	Keypad Board
8000 Series	=	GPS
9000 Series	=	Switches and User Interfaces

4. Interconnect Tie Point Legend:

UNSWB+	=	Unswitch Battery Voltage (7.5V)
SWB+	=	Switch Battery Voltage (7.5V)
R5	=	Receiver Five Volts
CLK	=	Clock
Vdda	=	Regulated 3.3 Volts (for analog)
Vddd	=	Regulated 3.3 Volts (for digital)
SYN	=	Synthesizer
DACRX	=	Digital to Analog Voltage (For Receiver Front End Filter)
VSF	=	Voltage Super Filtered (5 volts)
VR	=	Voltage Regulator

12-LAYER CIRCUIT BOARD DETAIL VIEWING
COPPER STEPS IN PROPER LAYER SEQUENCE

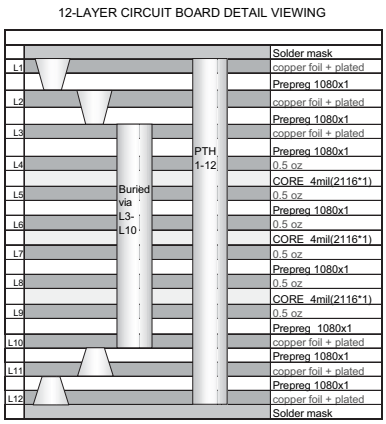


Figure 2-1: 12-Layer Circuit Board Detail Viewing

Section 3

TEST EQUIPMENT AND SERVICE AIDS

1.0 Recommended Test Equipment

The list of equipment contained in Table 3-1 includes most of the standard test equipment required for servicing Motorola portable radios.

Table 3-1. Recommended Test Equipment

Equipment	Characteristics	Example	Application
Service Monitor	Can be used as a substitute for items marked with an asterisk (*)	Aeroflex 2975 (www.aeroflex.com), Motorola R2670, or equivalent	Frequency/deviation meter and signal generator for wide-range troubleshooting and alignment
Digital RMS Multimeter *	100 µV to 300 V 5 Hz to 1 MHz 10 Mega Ohm Impedance	Fluke 179 or equivalent (www.fluke.com)	AC/DC voltage and current measurements. Audio voltage measurements
RF Signal Generator *	100 MHz to 1 GHz -130 dBm to +10 dBm FM Modulation 0 kHz to 10 kHz Audio Frequency 100 Hz to 10 kHz	Agilent N5181A (www.agilent.com), Ramsey RSG1000B (www.ramseyelectronics.com), or equivalent	Receiver measurements
Oscilloscope *	2 Channel 50 MHz Bandwidth 5 mV/div to 20 V/div	Leader LS8050 (www.leaderusa.com), Tektronix TDS1001b (www.tektronix.com), or equivalent	Waveform measurements
Power Meter and Sensor *	5% Accuracy 100 MHz to 500 MHz 50 Watts	Bird 43 Thruline Watt Meter (www.bird-electronic.com) or equivalent	Transmitter power output measurements
RF Millivolt Meter	100 mV to 3 V RF 10 kHz to 1 GHz	Boonton 92EA (www.boonton.com) or equivalent	RF level measurements
Power Supply	0 V to 32 V 0 A to 20 A	B&K Precision 1790 (www.bkprecision.com) or equivalent	Voltage supply

2.0 Service Aids

Table 3-2 lists the service aids recommended for working on the radio. While all of these items are available from Motorola, most are standard workshop equipment items, and any equivalent item capable of the same performance may be substituted for the item listed.

Table 3-2. Service Aids

Motorola Part No.	Description	Application
RLN4460_	Portable Test Set	Enables connection to the audio/accessory jack. Allows switching for radio testing.
RVN5115_	Customer Programming Software on CD-ROM	Allows servicer to program radio parameters, tune and troubleshoot radios.
PMKN4012_	Portable Programming Cable	This cable connects the radio to a USB port for radio programming and data applications.
PMKN4013_	Portable Programming, Testing & Alignment Cable	This cable connects the radio to a USB port for radio programming, testing and alignment.
PMNN4076_	7.5V Universal Battery Eliminator	Connects to radio via battery eliminator cable.
5880348B33	DMR SMA to BNC RF Adaptor	Adapts radio's antenna port to BNC cabling of test equipment.
PMHN4085_	Bench Test Housing Eliminator	Interconnects radio to power supply. Provides for troubleshooting of the radio when the housing is removed.
NLN9839_	Vacuum Pump Kit	Allows servicer to test for leakages.
NTN4265_	Pressure Pump Kit	Allows servicer to locate leakages.
5871134M01	Connector Fitting	This connector allows the vacuum hose to be connected to the radio chassis.
3271133M01	Fitting Seal	This seal secures the connector fitting to the radio chassis.

3.0 Programming, Testing and Alignment Cable

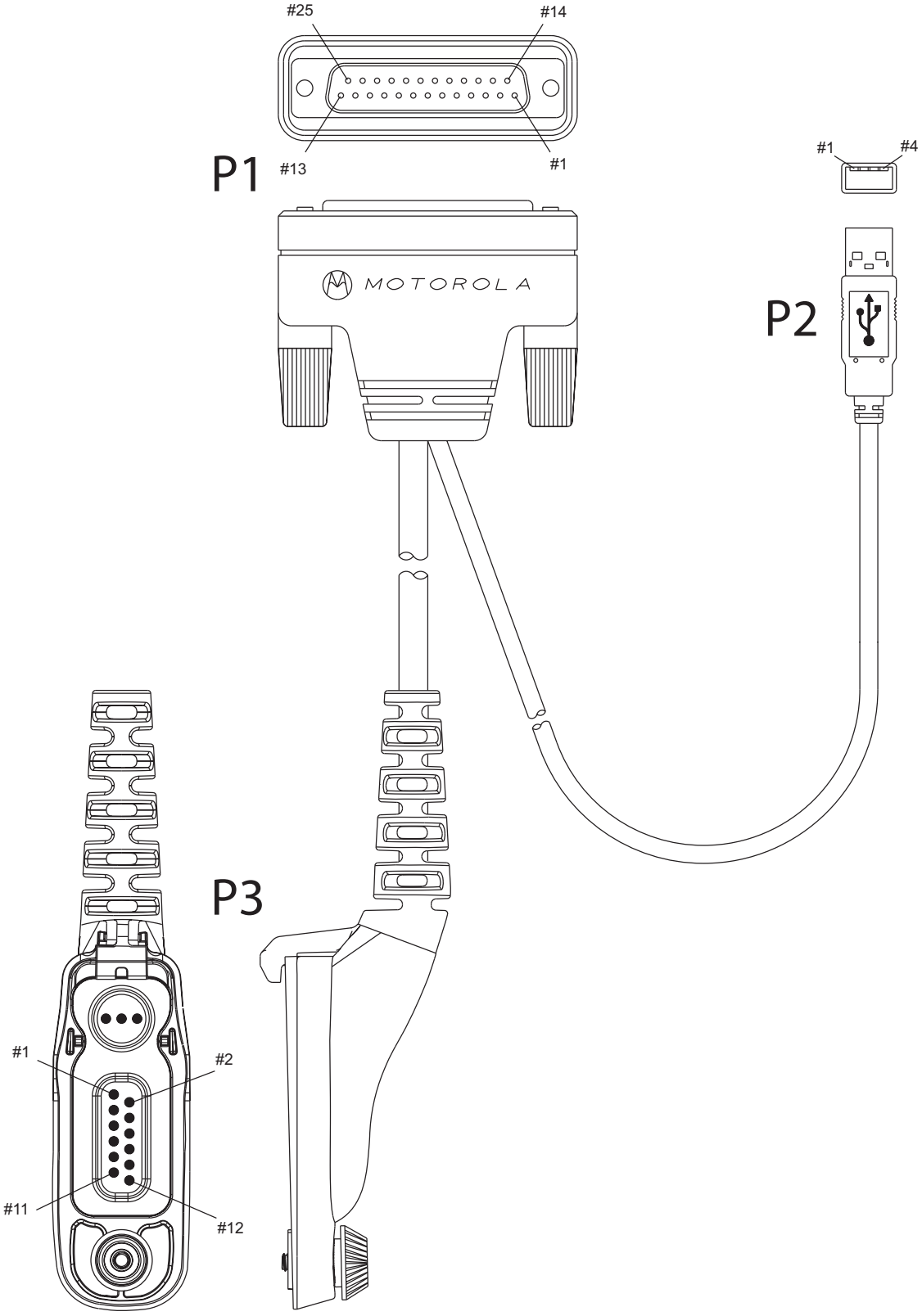


Figure 3-1. Programming, Testing and Alignment Cable

Table 3-3. Pin Configuration of Side Connector

CONNECTION			
P1	**P2**	**P3**	
Pin	**Pin**	**Pin**	**Function**
	1	3	VCC (5V)
	3	4	DATA +
	2	5	DATA -
16		6	GROUND
7		8	SPEAKER -
17		10	EXTERNAL MIC +
16		11	EXTERNAL MIC -
20		9	EXTERNAL PTT
1		7	SPEAKER +
	4	1 (Coax Connector)	GROUND

Section 4

POWER UP SELF-TEST

1.0 Power-Up Error Codes (Display Model only)

Upon powering up, the radio performs certain tests to determine if its basic electronics and software are in working order. Any error detected has an associated error code that is presented on the radio display. These error codes are intended to be used by a service technician when the radio generates the Self Test Fail Tone. If these tests are successfully completed, the radio will generate the Self Test Tone.

There are two classes of detectable errors, fatal and non-fatal. If it is considered as a fatal error, then the normal radio operation will be inhibited. Fatal errors include hardware errors detected by the microprocessor and certain memory errors. These memory errors include incorrect ROM checksum, incorrect RAM checksum, and incorrect checksums of codeplug (Persistent Storage) blocks that contain operating parameters. If the codeplug block operating parameters are corrupted, operation of the unit on the proper frequency, system, and group are in question. Attempts to use this information could provide the user with a false sense of security that others are receiving his messages. Corrupted codeplug blocks of call IDs, or their associated aliases are considered non-fatal errors. While the user may be inconvenienced, normal communication is still possible.

Table 4-4. Power-Up Error Codes

Error Code	Description	Error Type	Corrective Action
ERROR 01/02	Call ID or associated aliases codeplug block checksum is wrong.	Non-Fatal	Normal communication is still possible, but the user may be inconvenienced. Reprogram codeplug.
ERROR 01/22	Tuning Codeplug block checksum is wrong.	Non-Fatal	Normal communication is still possible.
FAIL 01/82	External Codeplug block checksum is wrong.	Fatal	Reprogram codeplug.
FAIL 01/92	Secure Codeplug check-sum error	Fatal	Reprogram codeplug.
FAIL 01/A2	Tuning Codeplug block checksum is wrong.	Fatal	Reprogram codeplug.
FAIL 01/81	ROM Checksum is wrong.	Fatal	Reprogram FLASH Memory, then retest. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 01/88	Radio RAM Test Failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 01/90 or FAIL 02/90	General hardware test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.

Table 4-4. Power-Up Error Codes (Continued)

Error Code	Description	Error Type	Corrective Action
FAIL 02/81	DSP ROM Checksum is wrong.	Fatal	Reprogram FLASH Memory, then retest. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/82	DSP RAM1 test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/84	DSP RAM2 test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/88	DSP RAM test failure.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
FAIL 02/C0	DSP ROM Checksum is wrong.	Fatal	Retest radio by turning it off and turning it on again. If message reoccurs, replace main board or send radio to nearest Motorola Depot.
No Display	Display module is not connected properly. Display module is damaged.	Fatal	Check connection between main board and display module. Replace with new display module.

NOTE A non-display radio emits only the Self Test Fail Tone if it fails the self-test.

2.0 Operational Error Codes

During radio operation, the radio performs dynamic tests to determine if the radio is working properly. Problems detected during these tests are presented as error codes on the radio's display. The presence of an error code should prompt a user that a problem exists and that a Motorola Authorized MOTO**TRBO** dealer should be contacted. Use Table 4-5. to aid in understanding particular operational error codes.

Table 4-5. Operational Error Codes

Error Code	Description	Error Type	Corrective Action
FAIL 001	Synthesizer Out-of-Lock	NON-FATAL	1. Reprogram the codeplug. 2. Refer to Detailed Service Manual.
FAIL 002	Personality checksum or system block error	NON-FATAL	Reprogram the codeplug.

Section 5

CONTROLLER INFORMATION

1.0 General Controller Block

The controller board is the central interface between the various subsystems of the radio. The controller section consists of 4 main ICs. These are the OMAP1710 Host/DSP Processor, Flash, DDR RAM memories and the MAKO Audio/Power Management chip.

Figure 5-1 shows how the controller interfaces with the RF Section and the supporting controls, switches and display. The Controller, RF sections, volume port, frequency selection switch and the universal connector are placed on a single “Transceiver” board. LCD Display is mounted directly to the Transceiver board and keypad is designed on the flex. The Option Board is a separate board that hosts the line/connections to the flex keypad. The physical interface between the Transceiver board and keypad board is via flex through board to board connector on the option board.

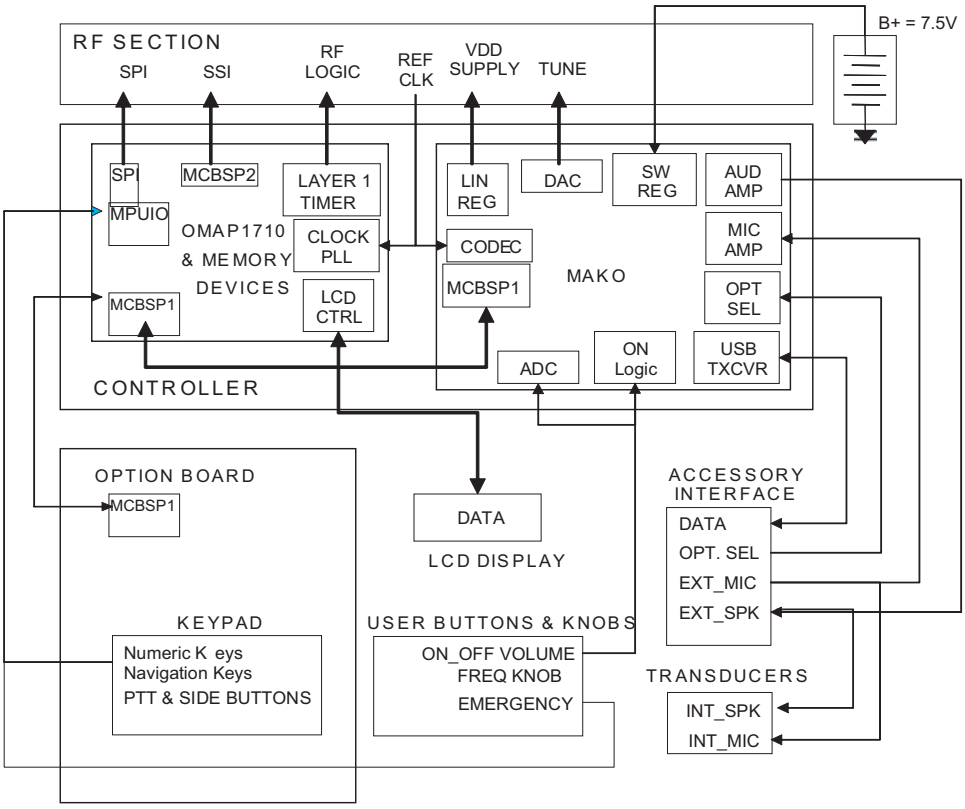


Figure 5-1: Controller Block Diagram

1.1 OMAP1710 Processor (U1000)

The OMAP processor (U1000) has a dual-core architecture which incorporates a TMS320C55x DSP core and a high-performance ARM926EJS core. The OMAP is supplied with two voltages: 1.4V for Core and 1.8V for Peripheral and I/O Interfaces.

The OMAP processor controls the operation of the transmitter, receiver, synthesizer and MAKO IC. It also uses Flash and DDR RAM, both located externally.

1.2 Flash Memory (U2000)

The Flash memory IC is a 64Mbit CMOS device. It is supplied with 1.8V. The Flash memory has its 25 address lines and 16 data lines connected to the External Interface Module (EIM) of the OMAP IC through the EMIFS_ADDR(25:1) and EMIFS_DATA(15:0) busses. The Flash memory contains host firmware, DSP firmware, codeplug data, and tuning values.

1.3 DDR RAM (U2001)

The Double Data Rate DRAM (DDR RAM) is 256Mb high-speed CMOS device. It is designed to operate in 1.8V, low-power memory system. The SDRAM has 13 address lines and 16 data lines connected to the EIM of OMAP IC through SDRAM_ADDR(12:0) and SDRAM_DATA(15:0) busses.

1.4 MAKO IC (U3000)

The MAKO IC handles DC power distribution and audio processing (i.e. audio amplification and analog-to-digital/ digital-to-analog conversions). It contains Switching and Linear regulators, 1W audio amplifiers, 16-bit Voice CODEC, 11-channel 10-bit A/D Converter, 10 bit D/A Converter, support 2xUSB “OTG” transceivers, One-Wire Option Detect, and GCAI ports.

2.0 Controller Board

2.1 Radio Power Distribution

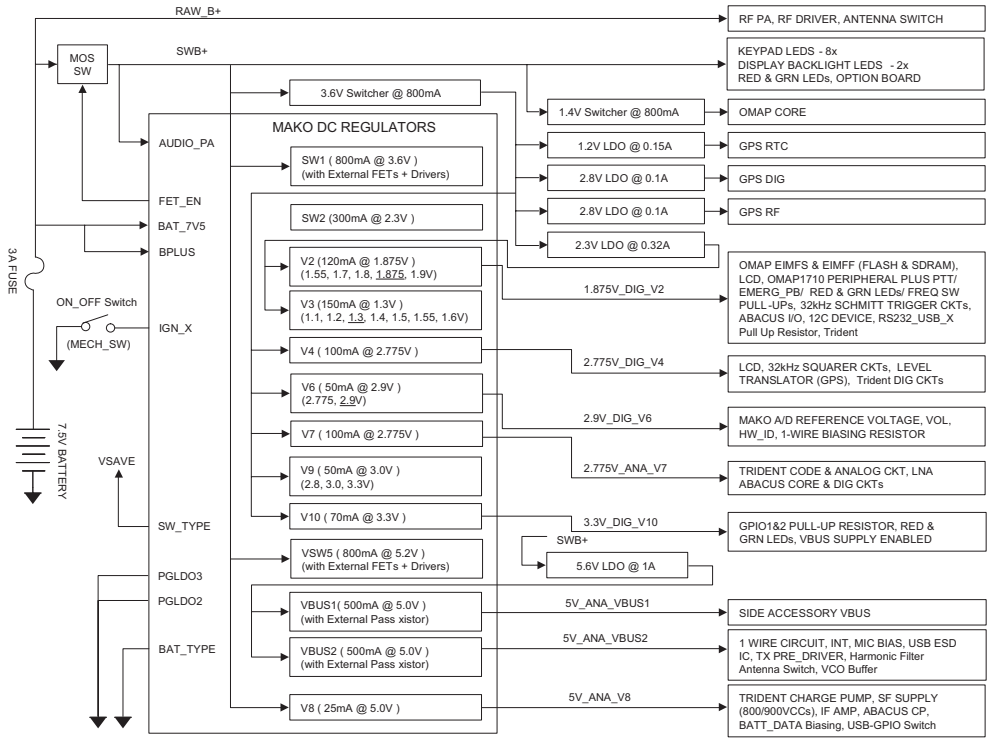


Figure 5-2: DC Power Distribution Block Diagram

Figure 5-2 illustrates the DC distribution to various ICs and devices in the radio. The power management architecture is centered on the MAKO IC (U3000). A battery supply is routed via a 3A fuse (F9000) which goes directly to the electronic ON/OFF control (PMOS power FET Q3003) as RAWB+. When the radio is turned ON, MECH_SW (ON/OFF/volume control) will trigger the MAKO FET_ENX to low thus turning ON the PMOSFET device, and SWB+ is then distributed as shown in Figure 5-2. SWB+ will continue to support the whole board until the radio is turned OFF.

2.1.1 Voltage Regulation

• Switcher U3020

Switcher (U3020) in conjunction with the MAKO power management IC (U3000) is a highly efficient dc-dc buck converter. External components L3020 and C3202 are needed to filter out the dc-dc converter output. In this application, it is configured as a Pulse Skipping Mode (PSM) with maximum output current of 600mA. It generates an accurate 3.6V output, which supplies directly to the MAKO internal VSW2 switcher circuit as well as other MAKO internal LDOs.

• Switcher U3021

Switcher (U3021) is a highly efficient dc-dc buck converter and same as switcher U3020. It is used solely for OMAP processor core.

• Low Drop Out (LDO) Regulator U3008

LDO regulator (U3008) is an adjustable output voltage regulator which can supply 200mA load current. It has an excellent Ripple Rejection Ratio and Short Circuit Protection. In this application, LDO U3008 output is 2.3V which is set by the resistor divider R3028 and R3029. It supplies directly to MAKO internal LDOs.

• Low Drop Out (LDO) Regulator U3002

LDO regulator (U3002) is an adjustable output voltage regulator which can supply 1A load current. In this application, LDO U3002 generates an accurate 5.6V output which is set by the resistor divider R3017 and R3018. It supplies directly to both VBUS1 and VBUS2 supplies. Q3005 and Q3006 prevent internal voltage leakage onto VBUS_SUPPLY (U3002 pin 5).

• MAKO LDO VBUS1

VBUS1 is a voltage regulation module that can be used to provide 5V with either 50mA or 500mA load current suited for accessory and USB supply. Q3001 and Q3002 are used to control the low current limit (50mA) or high current limit (500mA) of Vbus1.

When USB_CONNECT is toggled LOW, the PMOSFET (Q3001) is disabled and this will limit the max load supply to 50mA. If a high current limit is desired, i.e. USB HOST mode, USB_CONNECT is toggled HIGH turning ON the PMOSFET (Q3001) through Q3002 inverter, and this will limit the max load supply to 500mA.

• MAKO LDO VBUS2

VBUS2 is a voltage regulation module that can be used to provide 5V and with only 500mA load current. This supply is used for PA Pre-driver.

• MAKO LDOs

The MAKO power management IC (U3000) provides eight more LDOs. Some LDOs are programmable to meet the requirement of various ASIC devices. V2, V3, and V9 are programmable via SPI while V4, V5, V6, V8, and V10 are fixed. See Figure 5-2 for details.

2.1.2 Power ON/OFF

The radio can be switched ON in only one condition:

1. MECH_SW turned ON

Turning the rotary switch (S9001) ON will cause MAKO (U3000) to turn ON SWB+. After application of power to SWB+, MAKO regulators are sequenced to turn ON power to all MAKO internal blocks and external system including OMAP processor (U1000), FLASH (U2000), SDRAM (U2001), and radio RF section.

Radio can be turned OFF in one of the three conditions:

1. MECH_SW turned OFF

If the radio is manually turned OFF, MAKO (U3000) will start a 125ms watchdog timer. The OMAP processor (U1000) may tickle the watchdog timer as needed to keep DC power ON as it shuts down the radio. Once the watchdog timer expires, MAKO turns OFF the DC regulators and SWB+.

2. Low Battery

While the radio is ON, if battery voltage drops to low level threshold, OMAP processor (U1000) will initiate a shutdown process. It will store the radio personality data to the FLASH (U2000) before turning OFF.

3. Thermal Shutdown

Hard and Soft limits for thermal shutdown are implemented into MAKO IC (U3000). When MAKO die temperature reaches Soft Thermal Limit (135 °C), microprocessor will be interrupted to begin shutdown procedures. If Hard Thermal Limit (155 °C) is reached before OMAP processor (U1000) can finish shutdown tasks, the radio will turn OFF immediately.

2.2 Clocks

Figure 5-3 illustrates the controller clocks used throughout the radio.

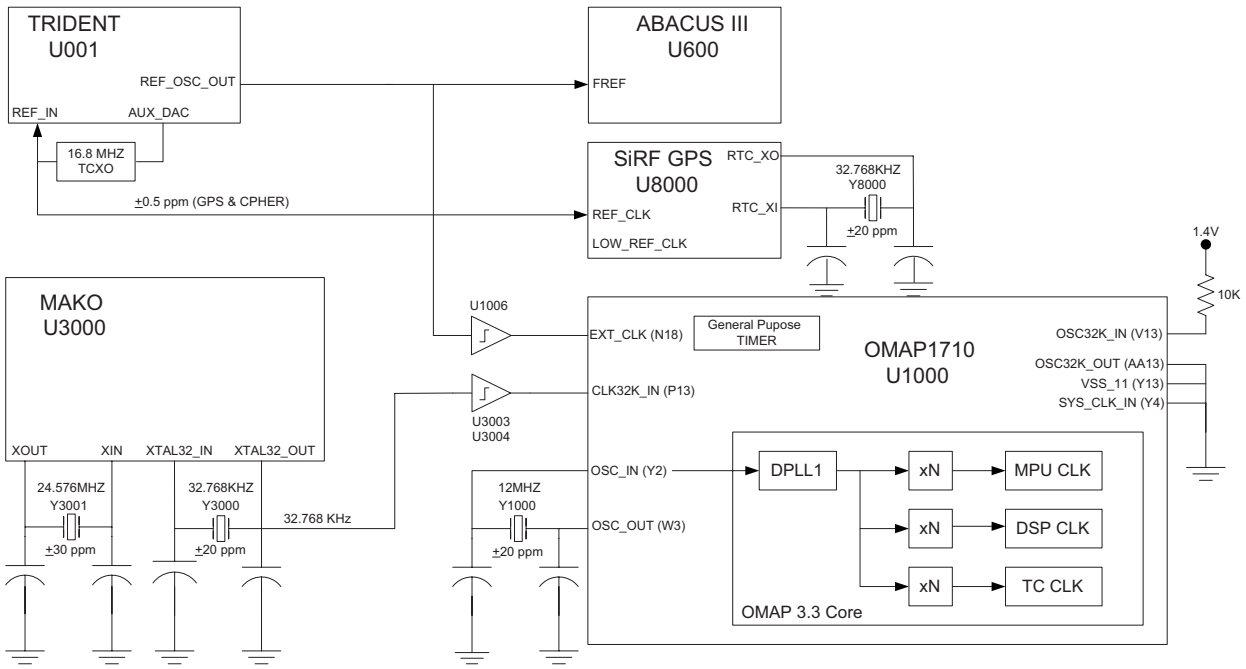


Figure 5-3: Clock Connections

The OMAP processor (U1000), which consists of an ARM and DSP core, needs three clocks for operation: a 32.768kHz square-wave, a 12MHz sine-wave, and a 16.8MHz square-wave clock.

The 16.8MHz clock source is provided from the Trident TCXO routes to a squarer-circuit (U1006) and feed to EXT_CLK (U1000 pin N18).

The 32.768kHz clock is generated by the MAKO crystal (Y3000) oscillator, converted to a gated clock by U3003 and U3004 circuitry. It is then directly fed to OMAP CLK32_IN (U1000 pin P13). The OMAP processor needs the 32.768kHz to determine the input reference clock applied to OSC_IN (U1000 pin Y2). Without this 32kHz clock, the OMAP will potentially program all the wrong dividers for USB and UART booting. External pull-up on OSC32K_IN (U1000 pin V13) and grounding both OSC32K_OUT (pin AA13) and VSS_11 (pin Y13) indicates that an external 32kHz clock is used.

The 12MHz sine-wave is the main system reference clock for the OMAP which all the internal clocks are derived from.

The 24.576MHz crystal (Y3001) oscillator is the reference clock for MAKO CODEC and SSI clock. `

2.3 Serial Peripheral Interface (SPI)

Figure 5-4 illustrates the controller SPI used throughout the radio.

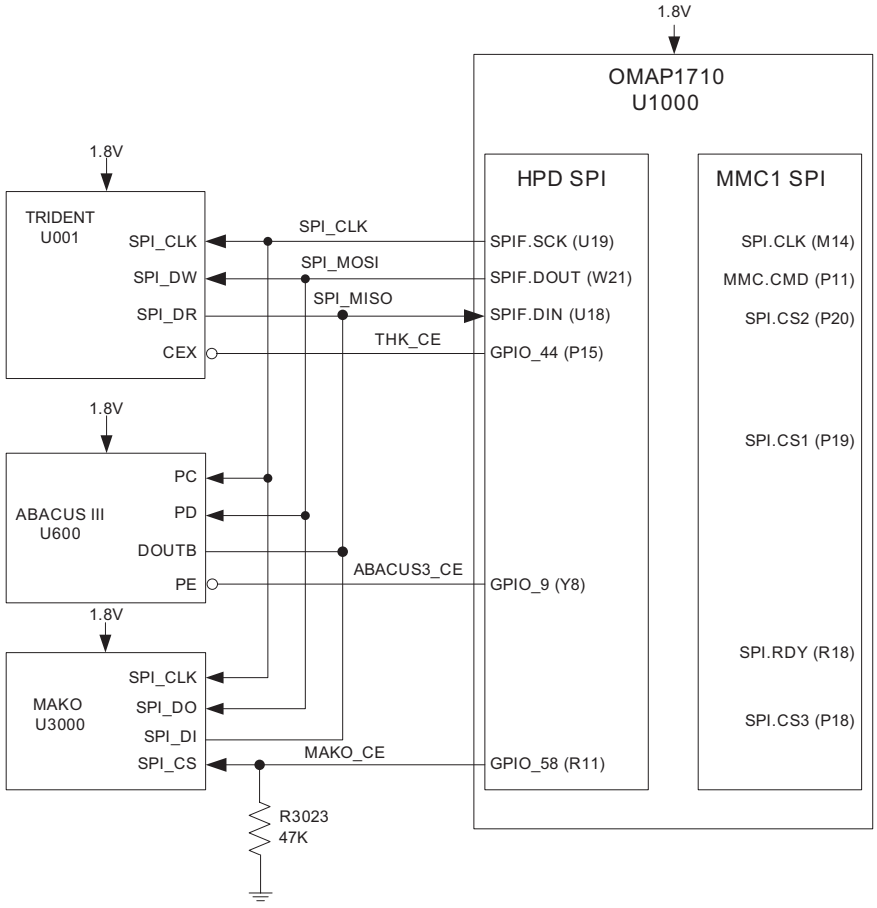


Figure 5-4: SPI Connections

The OMAP processor (U1000) has two SPI busses that it uses to communicate with the various peripheral IC's. The first is the High Performance Data (HPD) SPI bus and the second is the multi-media card (MMC) SPI.

The HPD SPI is a synchronous serial bus made up of four lines, SPI_CLK, SPI_MOSI, SPI_MISO, and chip select. The SPI_CLK line is used to control the speed of the data to/from the peripheral IC's and the OMAP processor. This clock can be adjusted to different speed based on the IC's specification.

HPD SPI module is used to interface to Trident (U001), Abacus III (U600), and the MAKO (U3000). This interface operates at 1.875V logic level. SPI_MOSI, or commonly known as TRANSMIT Data, is a data string from OMAP while SPI_MISO or RECEIVE Data is data string to the OMAP.

The MMC SPI is not used in portable radio.

2.4 Serial Synchronous Interface (SSI)

Figure 5-5 illustrates the controller SSI used in the radio controller design.

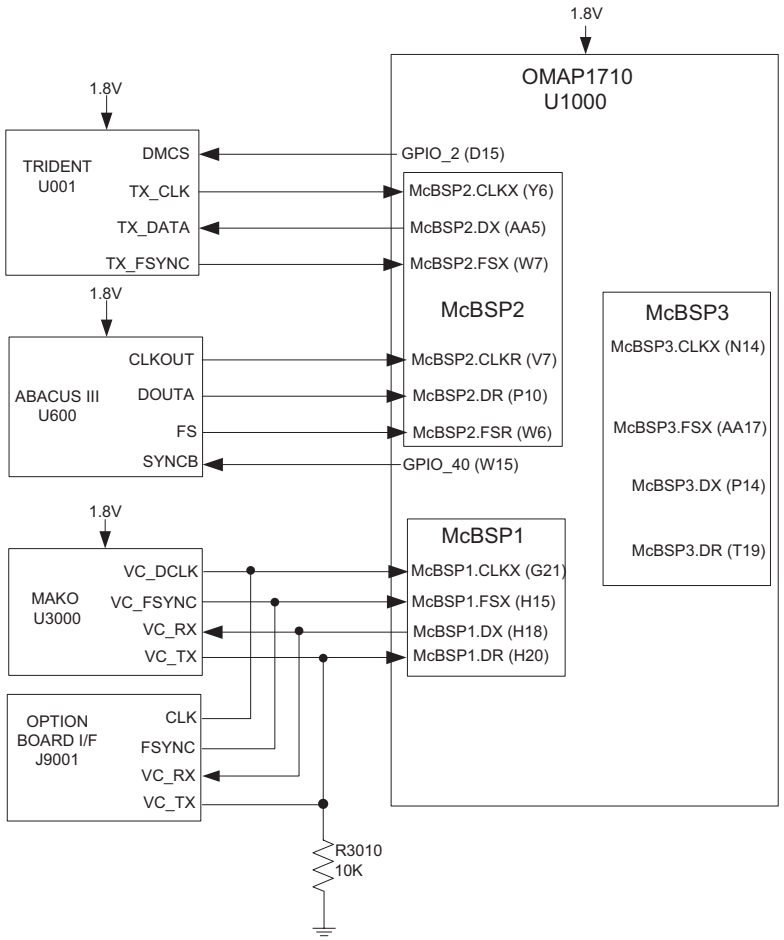


Figure 5-5: SSI Connections

The OMAP processor (U1000) has a total of three SSI or multi-channel buffer serial ports (McBSP) modules that are used to directly interface to the CODECs in the Trident, Abacus, and MAKO, as well as command/ data connections to the Option Board, and between Tx and Rx radios within a Repeater.

As shown in Figure 5-5, McBSP1 is a 4-wire bus and interface to the MAKO CODEC as well as the Option Board. McBSP2 is 6-wire bus; 3-wire dedicated to the Trident Tx audio and the other 3-wire to Abacus Rx audio. McBSP3 is a 4-wire bus, and used primarily to interface between Tx and Rx radios within a Repeater.

2.5 ACC_ID Interface

Smart accessories use the Accessory ID (ACC_ID) Interface to help the radio determine which smart accessory, if any, are attached to the radio. Figure 5-6 illustrate the ACC_ID connections used within the radio.

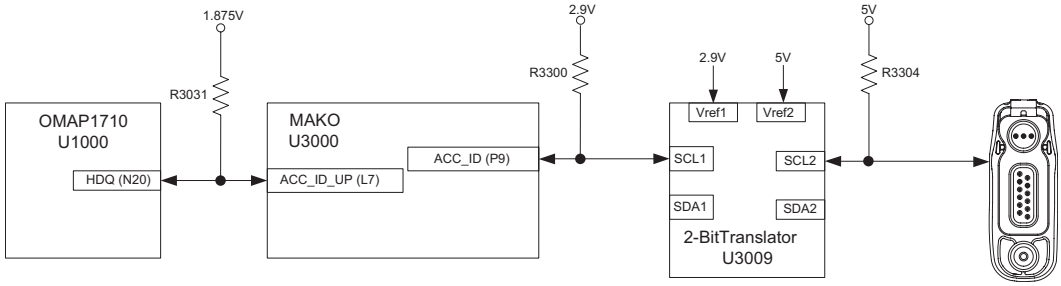


Figure 5-6: ACC_ID Interface Connections

2.6 USB Interface

The OMAP processor (U1000) supports two USB ports. The radio makes use of one USB port to communicate with smart accessories, and connection to a host computer for radio programming via CPS and tuning via Tuner Tool.

Note: The USB ports are designed to support Motorola accessories only and will not support third party “Plug-n-Play” USB devices.

Figure 5-7 shows the details of the HSSI connections within the radio.

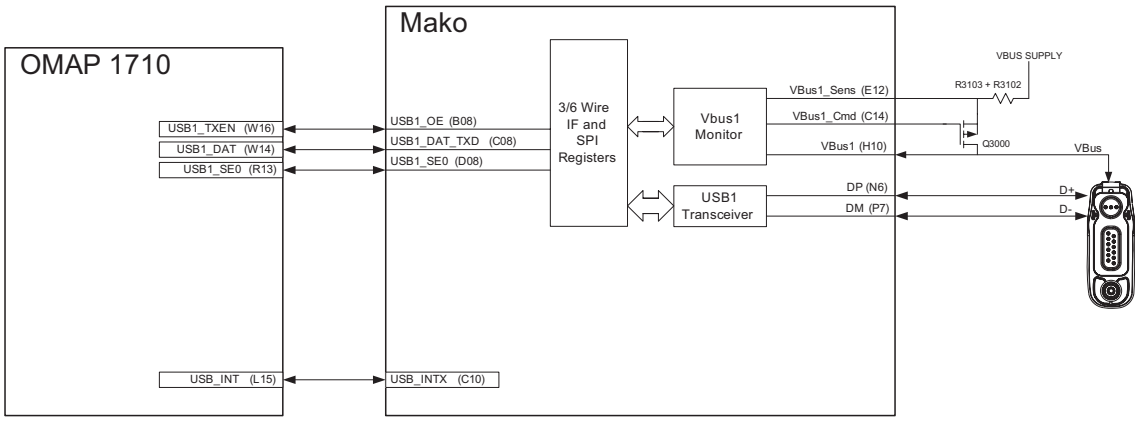


Figure 5-7: USB Interface Connections

The OMAP processor USB host controller communicates with accessories at either 1.5 Mbps or 12 Mbps data rates depending on the accessory. The USB port can be used as a host or a device.

In the portable radio, only one of the two MAKO USB transceivers is used to provide the physical layer signaling for the USB port. The transceiver generates and receives the DP and DM differential signals of the port. The MAKO transceiver interfaces to the OMAP processor through a three-wire interface consisting of two bi-directional signals (SE0 and DAT), and one uni-directional signal (TXEN). The MAKO also includes a Vbus monitor that senses the connection or removal of a device and determines whether or not to supply current to that device via Q3000 up to a high current limit of 500mA.

The USB host/device mode assignment is determined when a user attaches a USB device to the port. The accessory contains information about what the USB mode assignment should be, this information is sent to the radio via the ACC_ID. See section 2.5 on page 5-7 for more details on the ACC_ID implementation. When configured as a host, VBUS is turned ON by MAKO and set to high current limit, when configured as a device, VBUS will be shut OFF and the external host supplies the VBUS power.

2.7 Universal Connector (Side Connector)

The universal connector is located on the side of the radio. It is the external port of interface used for programming and interfacing to external accessories. The universal connector is connected to the main board via a flex through option board. This radio UC is a newly defined Motorola accessory port that contains audio, digital I/O, serial interfaces, and accessory supply lines; and is similar in function to Motorola's legacy microphone connectors. The multiplexing of these functions is handled by circuitry internal to the MAKO (U3000).

The UC includes 2 serial interfaces: an USB port and an ACC_ID interface. The USB port can be used as either a device (radio is device) or as a host (radio is host). When configured as a device, the radio can be programmed using the MOTOTRBO CPS or tuned using the Tuner software. When configured as a host, various smart accessories can be used with the radio. See section 2.6 on page 5-7 for more information on the USB interface.

The ACC_ID interface is used by accessories to provide the radio with information needed to configure the interface for that accessory. See section 2.5 on page 5-7 for more information on the ACC_ID interface.

Note: The USB port is designed to support Motorola accessories only and will not support third part "Plug-n-Play" USB devices.

2.8 Keypad Module

The keypad module is connected to the main board through option board. This unit is not considered field-repairable. The keypad interface is a standard pulsed 4 row by 4 column configuration controlled directly by the OMAP processor (U1000). Each of the 4 column output lines is toggled high in sequence and the 4 row input lines are monitored to detect if a button has been pressed. The OMAP processor then decodes which button was pressed using the appropriate column and row stimulus and response information.

2.9 Display Module

This display is Film-compensated Super Twisted Nematic (FSTN), 132x34 pixel dot matrix with transflective mode and yellow-green LEDs backlighting Liquid Crystal Display (LCD) module custom to Motorola.

This display module is constructed of glass by sandwiched with polarizers, TAB (Tape Automated Bonding) IC driver, LED backlighting, display control circuitry flex with 16-lines receptacle connector connected to the main board display connector (P9000). The LED and backlights are controlled via serial connection with OMAP processor (U1000). The serial interface consists of clock, data, and chip select lines that are connected directly from the OMAP processor.

2.10 Audio

The audio circuitry consists of both analog and digital audio paths. Figure 5-8 shows the basic block diagram of the audio interconnections.

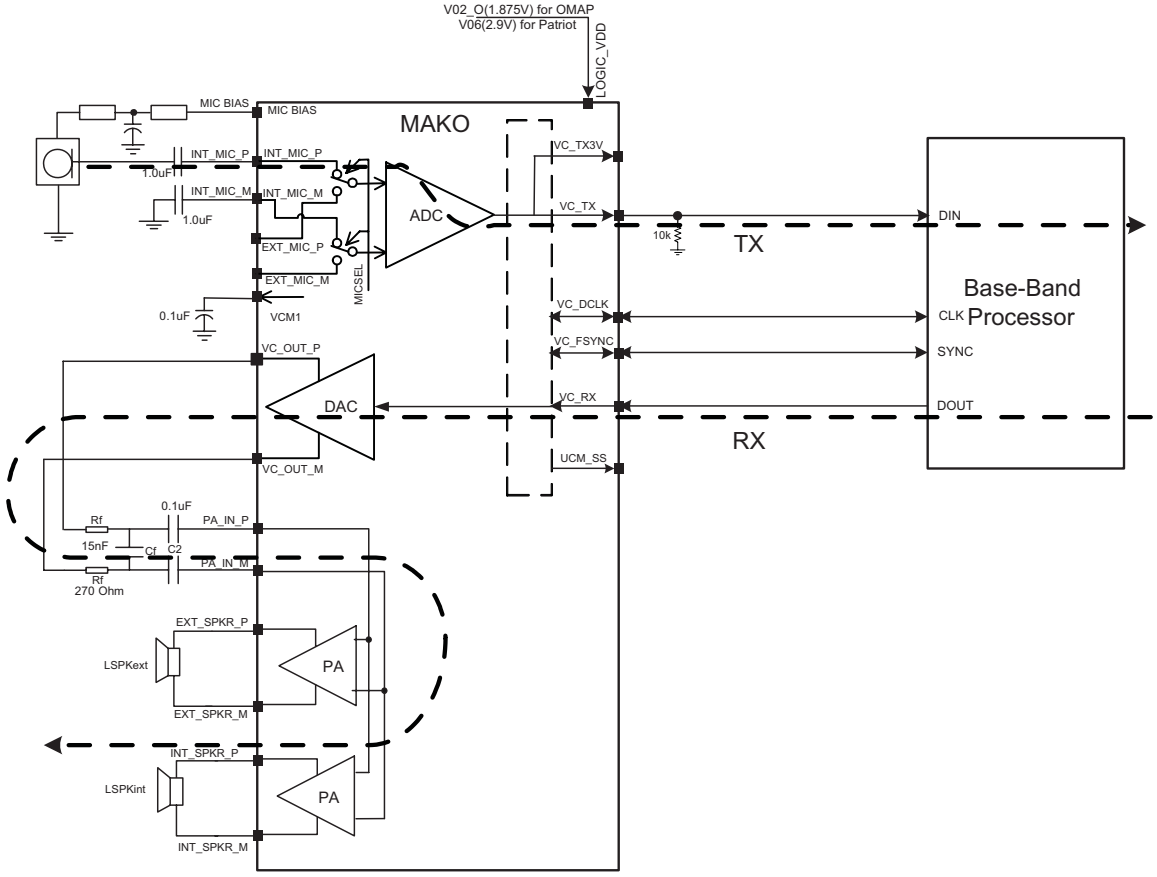


Figure 5-8: Audio Block Diagram

2.10.1 Receive Audio

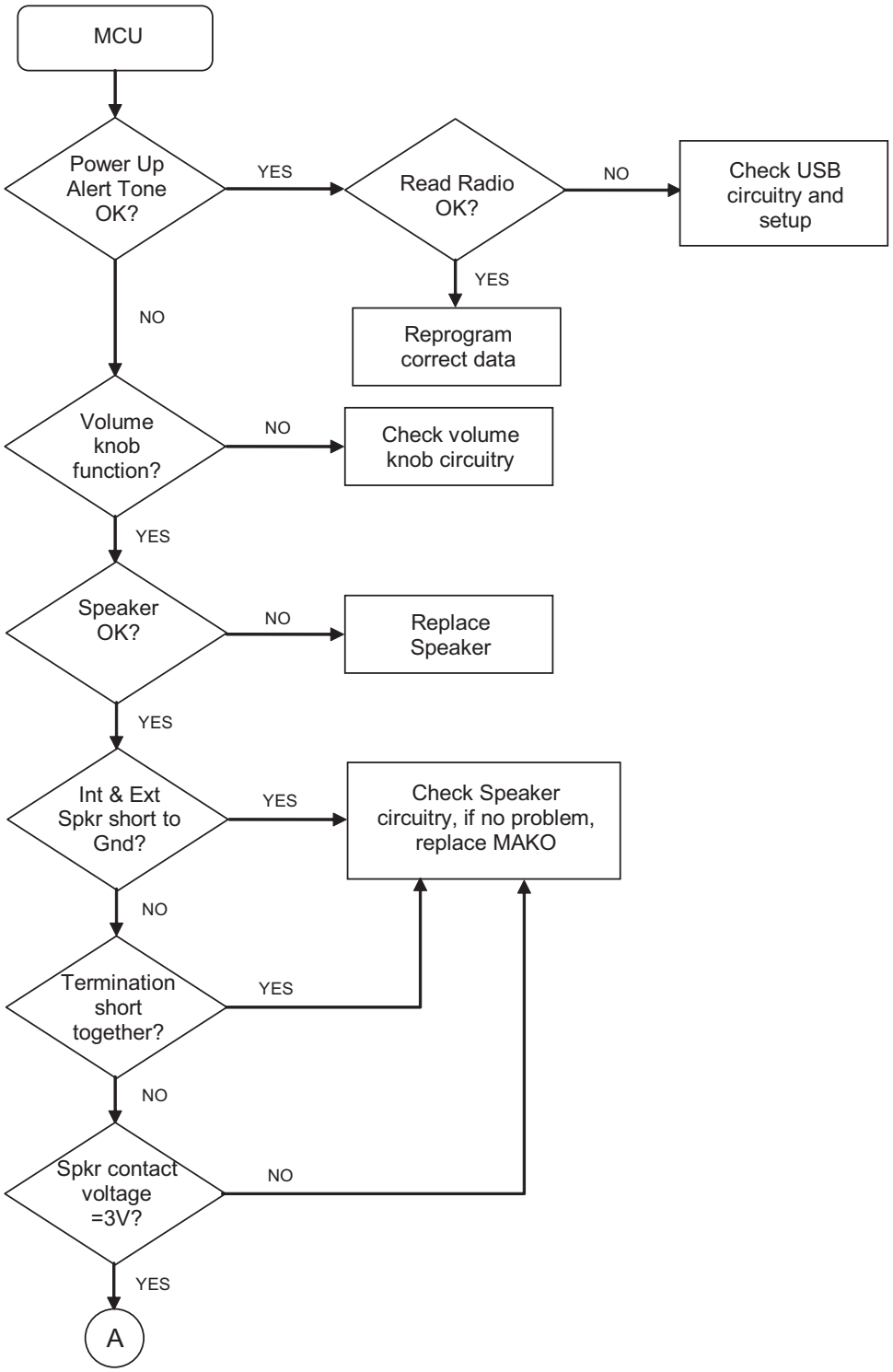
The receive audio data comes from the ABACUS III IC (U600) to the OMAP McBSP2 pin. The DSP decodes the data and sends it out through SSI lines to MAKO SSI pin. The SSI bus is comprised of four lines: clock, frame sync, Rx data, and Tx data. These four lines provide data to the MAKO (U3000) using a packet frame structure consisting of four slots. The actual audio data is transferred to the MAKO in the first slot of each frame using 16-bit pulse-code modulated PCM audio. The MAKO codec filters and converts the digital data into an analog audio signal, and this signal is sent to a programmable gain amplifier. The analog audio circuitry routes the audio to the internal or external port.

2.10.2 Transmit Audio

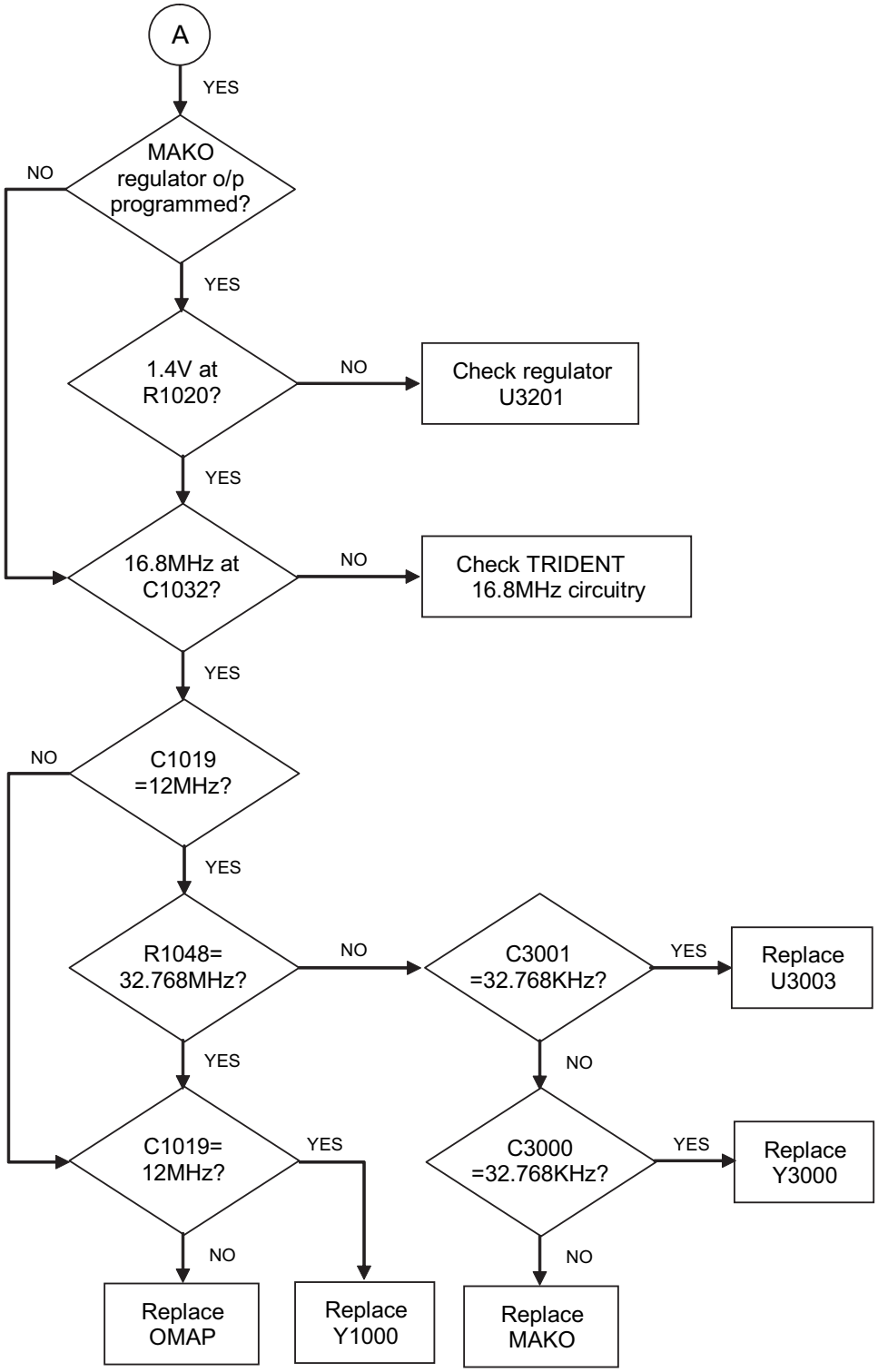
Transmit audio can be sourced from either internal or external microphone path. Both the internal and external microphone carries a 5V bias through a resistor to MAKO MIC_BIAS pin. The MAKO, through SPI, selects the appropriate microphone path to route to the necessary gain stages and converter that will send 16-bit PCM audio to the OMAP for signal processing via the SSI bus.

The transmit gain stages in the MAKO is calibrated based on an 8mV input under standard test conditions. The microphone sensitivity is programmable through the use of CPS.

2.11 Troubleshooting Charts

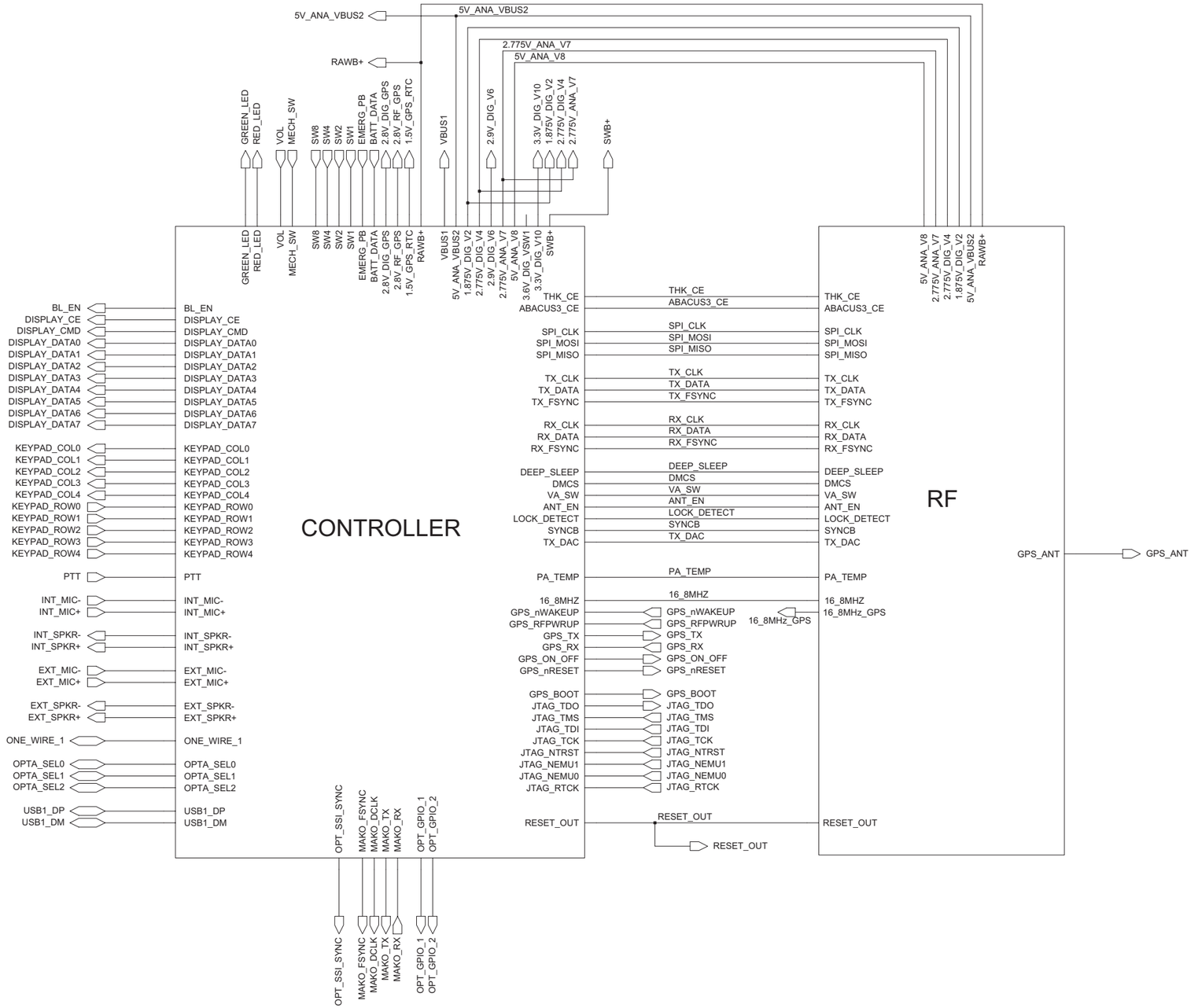


Troubleshooting Flow Chart for Controller (Sheet 1 of 2)

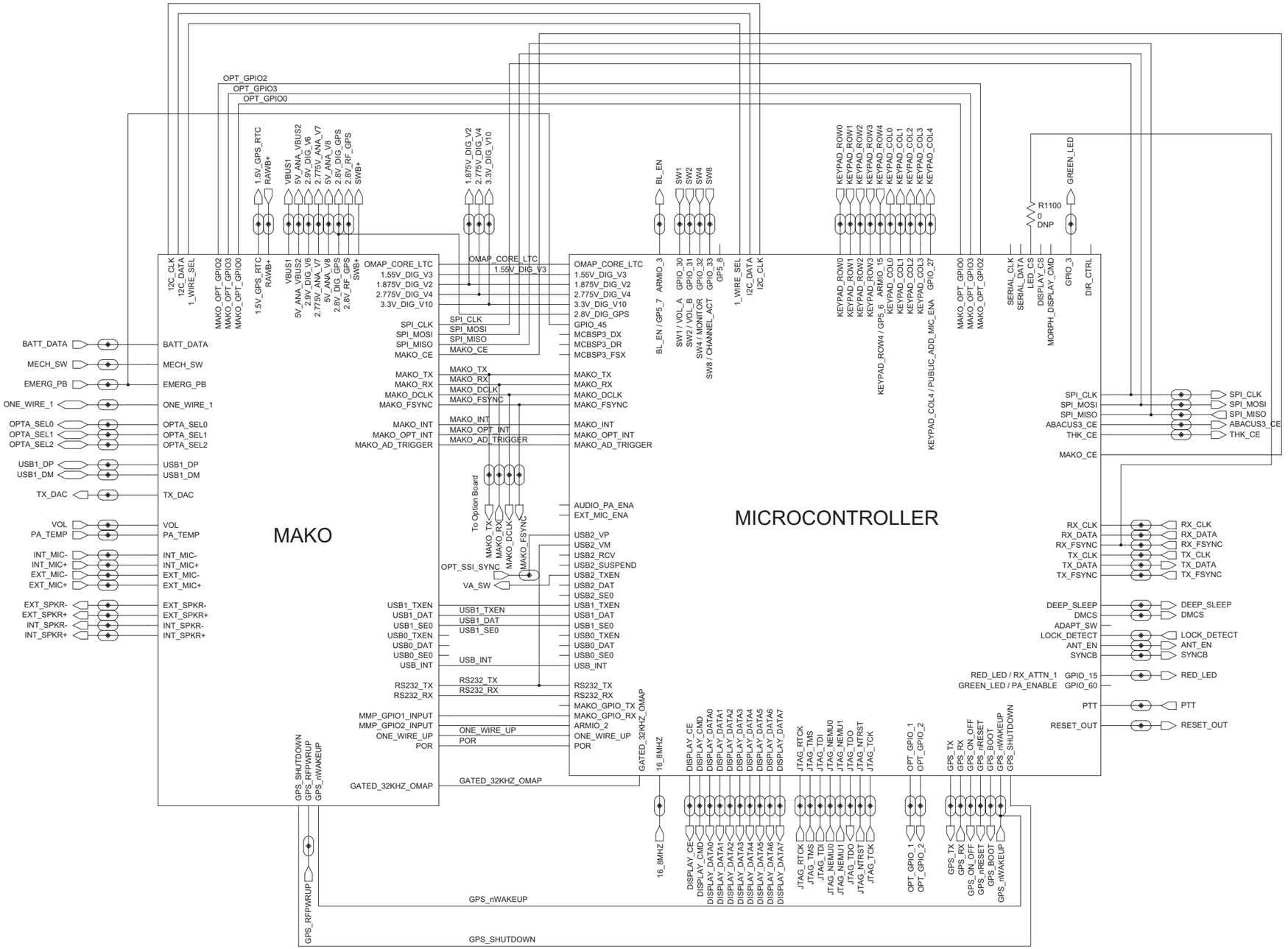


Troubleshooting Flow Chart for Controller (Sheet 2 of 2)

2.12 Controller Schematics

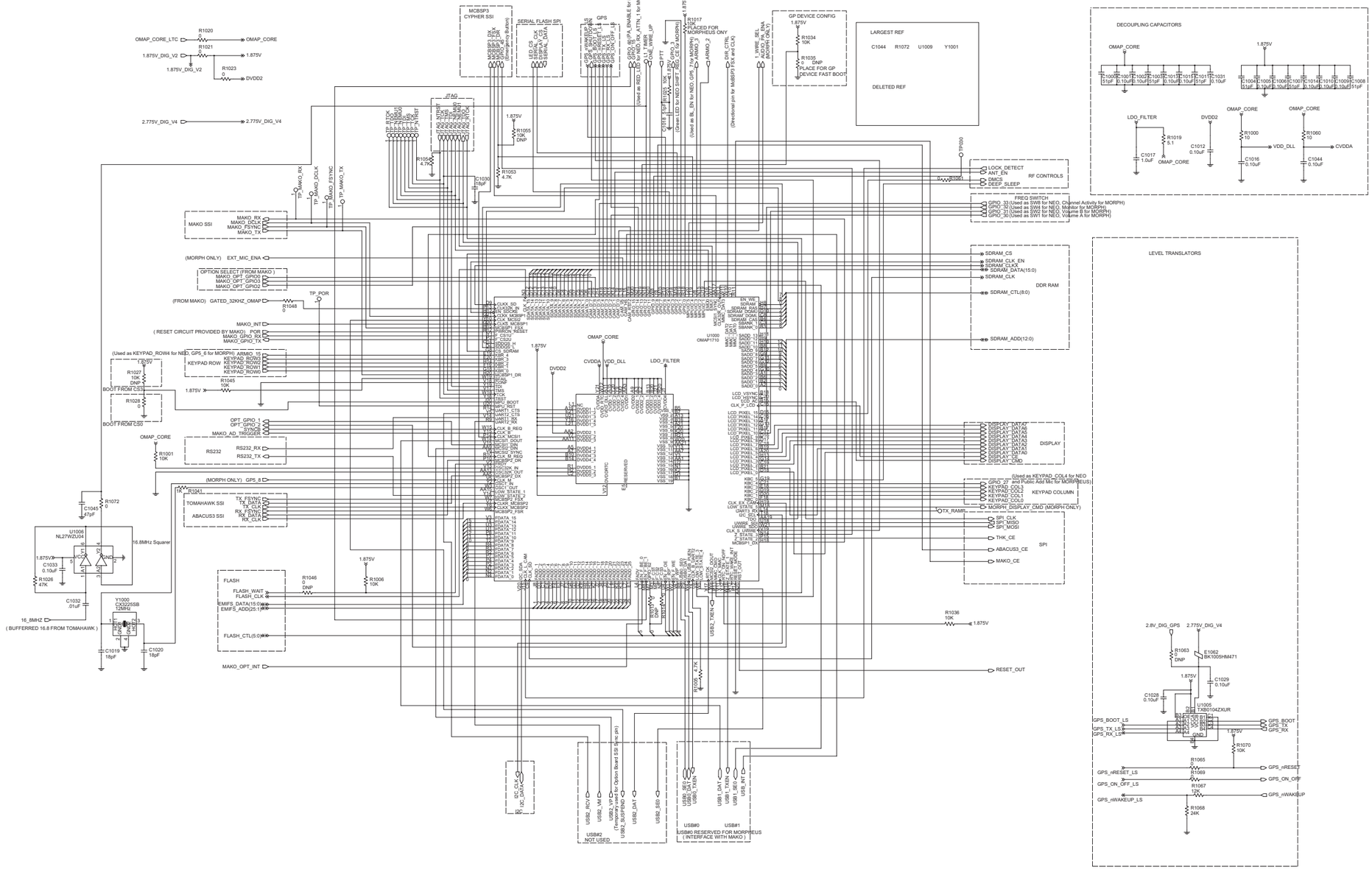


Complete Controller Schematic Diagram



MAKO-Controller Schematic Diagram

OMAP1710



Complete Controller Microprocessor Schematic Diagram

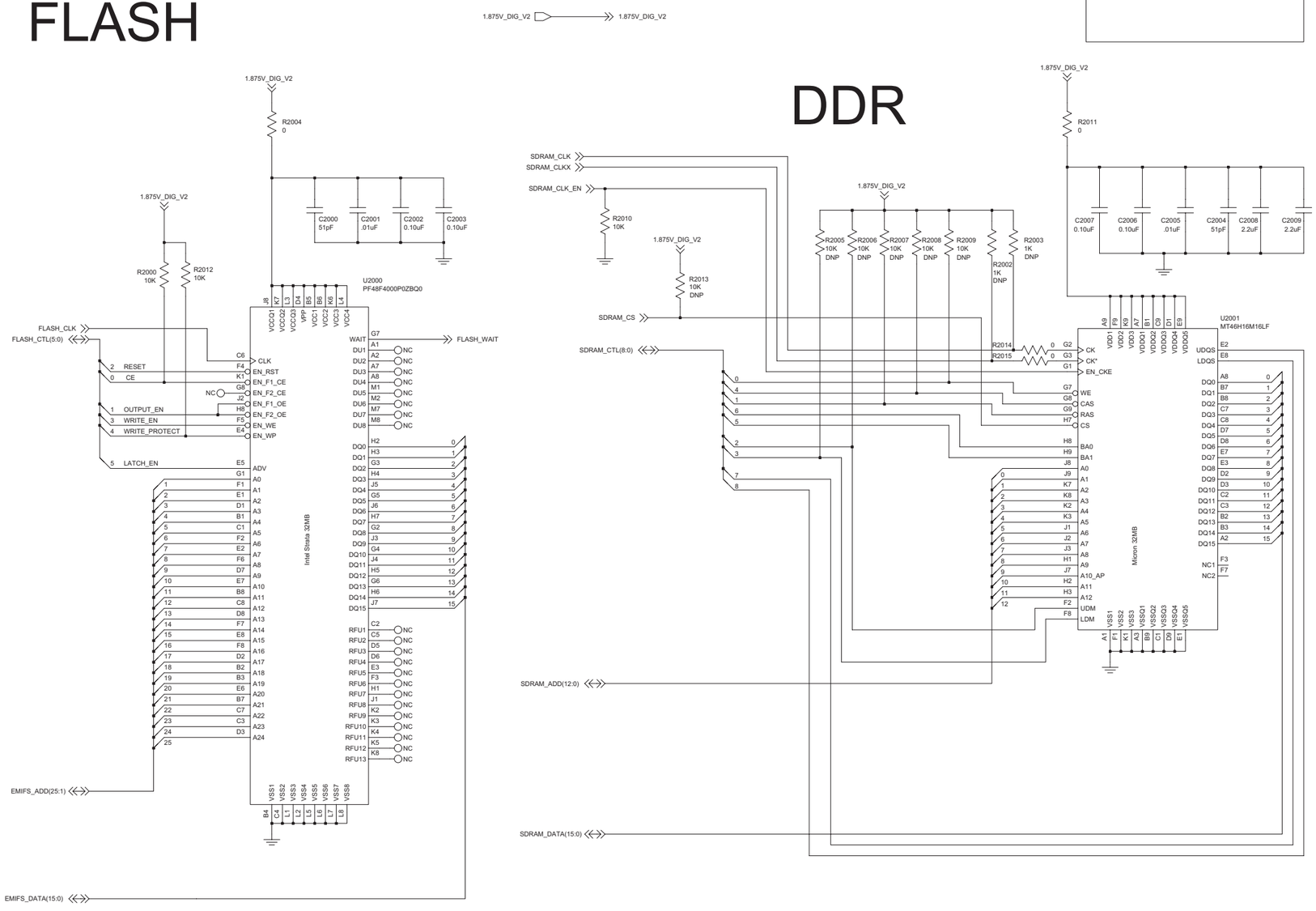
EXTERNAL MEMORIES

LARGEST REF

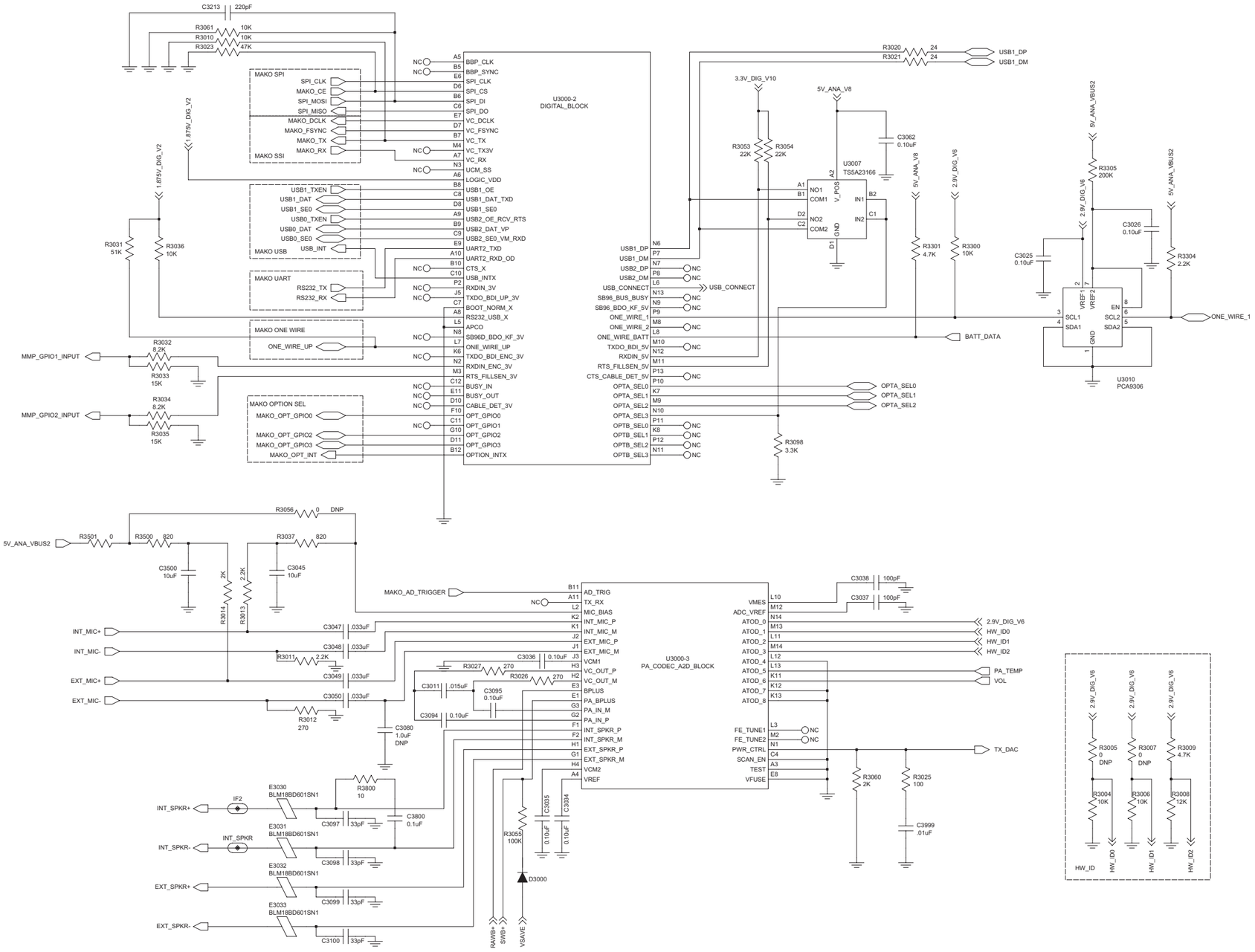
C2007 R2013 U2001

FLASH

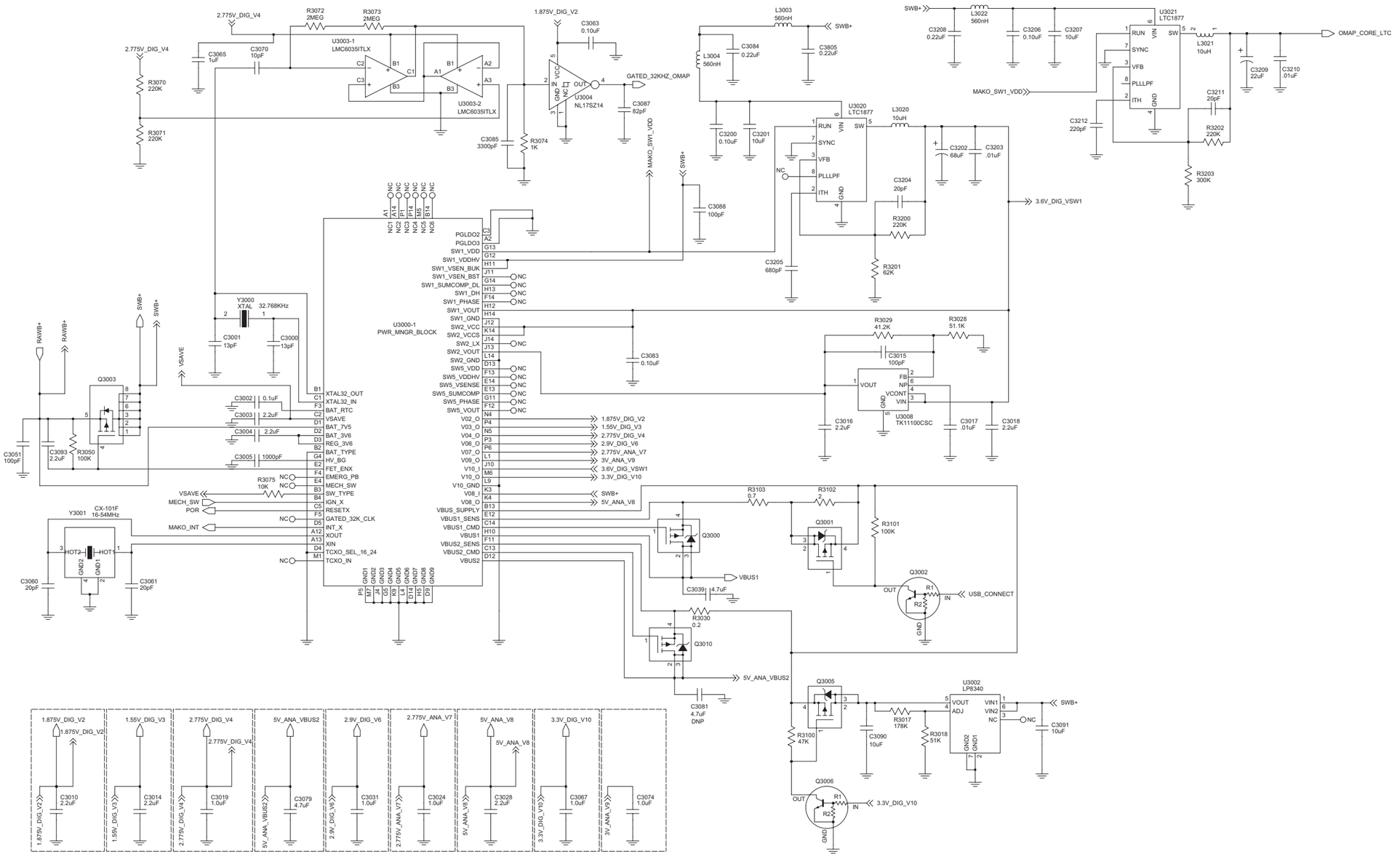
DDR



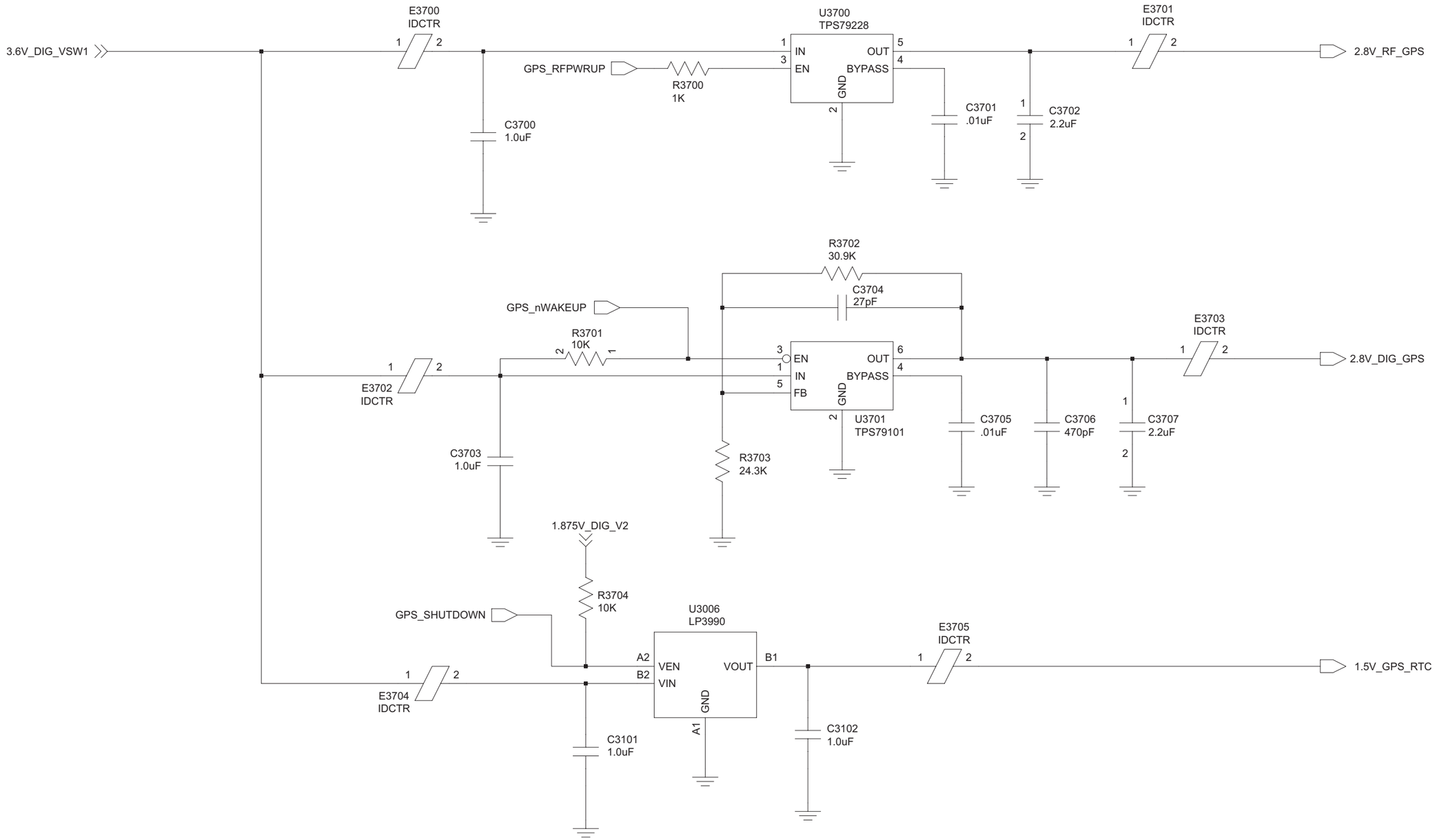
Controller Memory Schematic Diagram



Controller Audio and Digital Interface Schematic Diagram

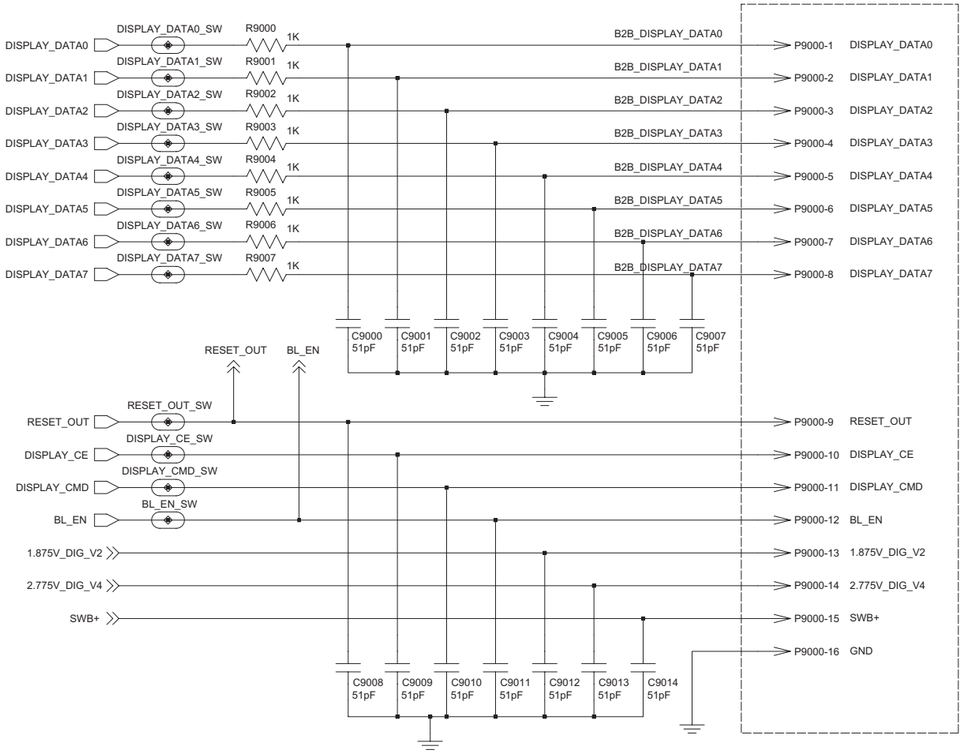


Controller Power Management Block Schematic Diagram (for 8478056A01)

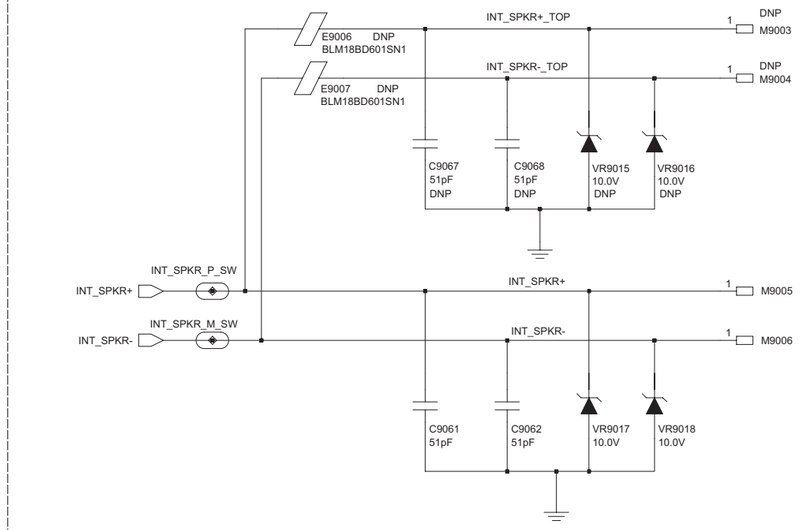


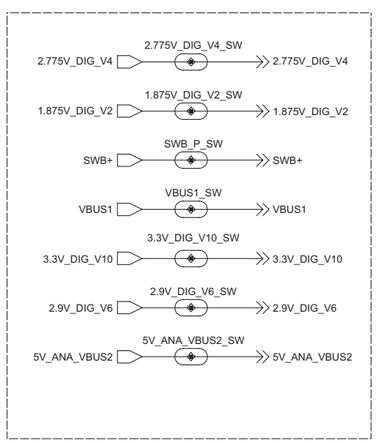
Controller Line Regulators for GPS Schematic Diagram

DISPLAY B2B 16 PINS CONNECTOR (2887818K02)



INTERNAL SPEAKER CONTACT

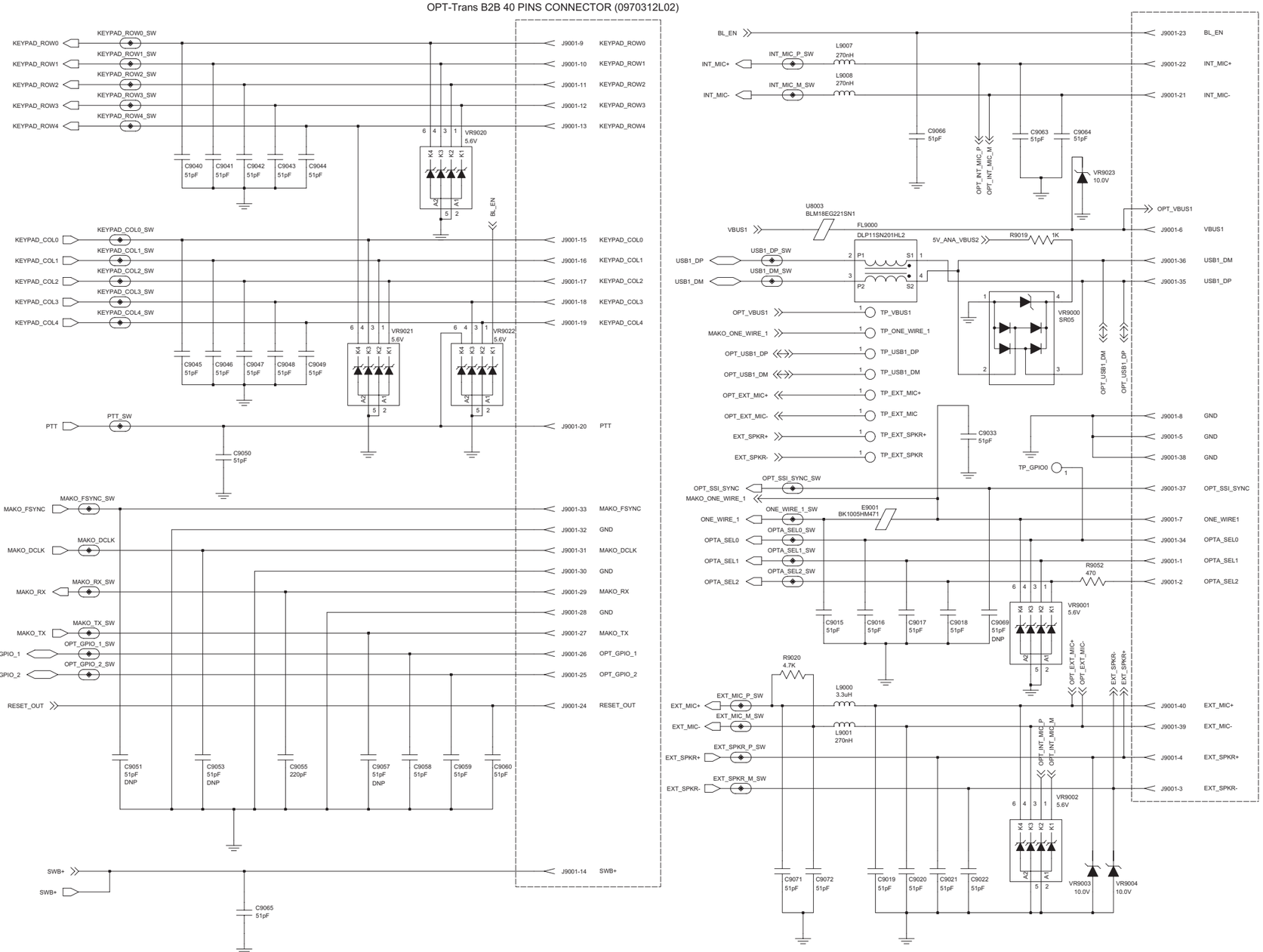




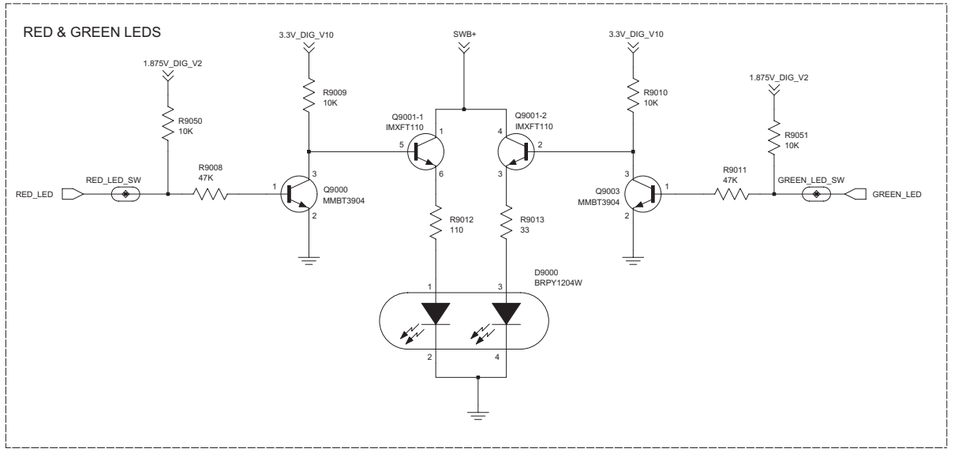
Largest reference designator

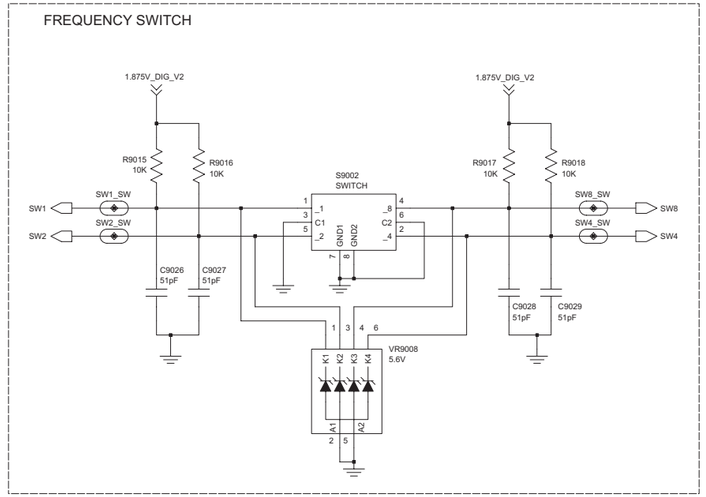
R9018	Q9003	M9007
C9068	E9007	J9001
VR9018	FL9000	P9000
D9000	L9008	
S9002		

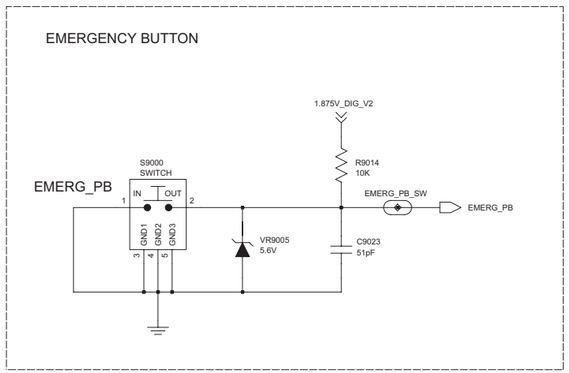
Controller LCD and Speaker Interface Schematic Diagram (for 8478056A01)

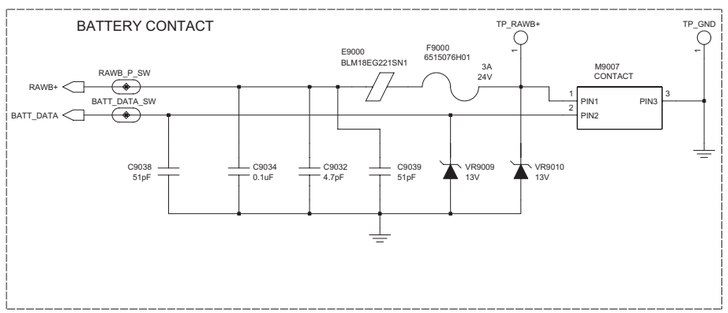


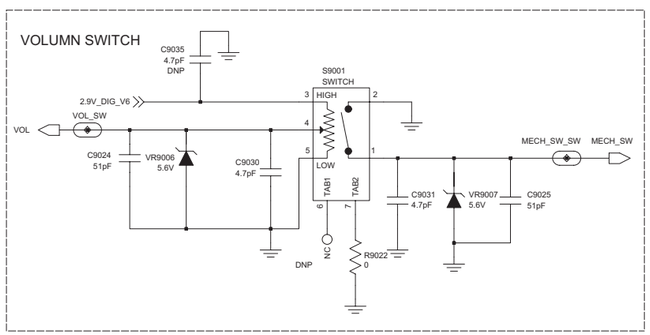
Controller UC Interface Schematic Diagram (for 8478056A01)

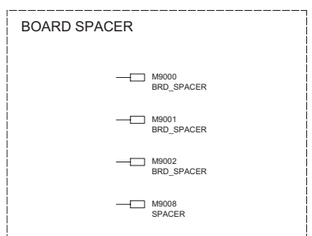












Controls and Switches Schematic Diagram (for 8478056A01)

Section 6

800/900 BAND (806–941 MHZ) INFORMATION

1.0 Transmitter

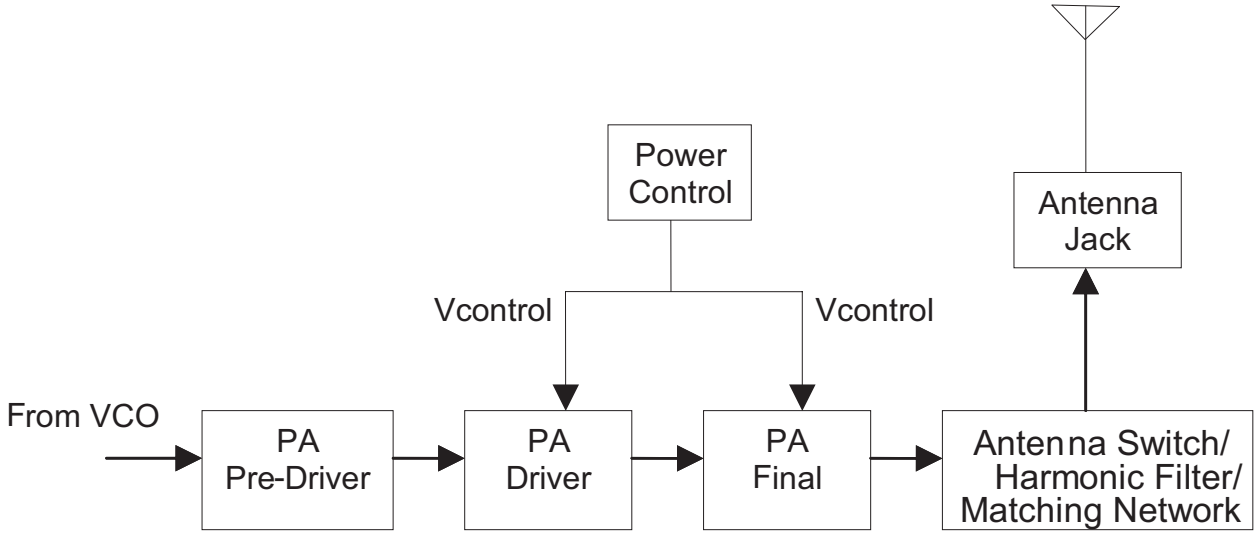


Figure 6-1: 800/900 Transmitter Block diagram

1.1 General

The transmitter contains five basic circuits:

1. Power Amplifier
2. Antenna Switch
3. Harmonic Filter
4. Antenna Matching Network
5. Power Control

1.1.1 Power Amplifier

The power amplifier is a 3-stage discrete design consisting of:

1. Pre-driver, ADA4743 (U700)
2. Driver, RD01MUS1 (Q703)
3. Final PA, RD05MMP1 (Q704)

The pre-driver is a 50 Ohm gain block with a supply voltage of 5V. The gate bias is ramped to eliminate feed-through power due to the fixed gain of the device. The pre-driver is biased in Class A region with a typical current drain of 60mA and power gain of 16.5dB.

The driver is a 1W, LDMOS in a SOT-89 package. this stage typically drains 150mA of current at rated output power, 2.8W at the antenna. The driver is biased in Class AB region and has a power gain of 10dB.

The final PA is a 5.5W, LDMOS device. The gate threshold of this device is very close to the driver. Hence, the traditional PA bias tuning is eliminated. The current drain would typically be 1300mA. The final PA is biased in Class AB region and has a power gain of 8dB.

1.1.2 Antenna Switch and Harmonic Filter

The antenna switch comprises of 2 GaAs switches: U900 and U901.

The switches are located between the transmit/receive path and the standard/remote ports

During the transmit mode operation, the ANT_EN line turns on the Q900 switch to route the transmit signal from pin J3 to J1 of U901 GaAs switch to the harmonic filter which consists of C902,C904,C905 and L901.

After the harmonic filter, another GaAs switch determines the remote and standard port. The VA_SW from OMAP which controls this switch will remain high to route the transmit/receive signal to/from the standard port.

Once the VA_SW is high, all the RF signals will be routed to the remote port.

After the second GaAs switch, U900, along the standard port path, L900,C901,C912,C913,C914,L905 and L906 serves as a diplexer for the RF and the GPS path. The overall insertion loss of the switch and the harmonic filter is around 1.6dB.

1.1.3 ESD Protection Circuit

C911, L907 and C910, L908 form a high pass filter on the standard port and remote port. The high pass filter and the ESD protection suppressor (VR901, VR900) are used to suppress the ESD pulse from the antenna jack and bull eye in order to protect the RF GaAs switch U900.

1.1.4 Power Control

The transmitter power control uses discrete integrator approach, to sense the current of both PA stages namely, Driver Power Amplifier (Q703) and Final Power Amplifier (Q704).

The basic block diagram of the power control is shown in Figure 6-2. A single sensing resistor (R700) is used to sense both PA stages current. The power control consists of 2 comparators, U701-1 and U701-2. U701 is a dual-package op-amp in SOT-8 package. The first stage is an I-V converter converts current drained by Power Amplifier Driver (Q703) and Power Amplifier Final (Q704) across R700 into a voltage drop and the second stage is an integrator used to shape the output Vcontrol to bias both PAs. The slope of the Vcontrol is controlled by the RC time constant of the integrator and also the ramping slope of reference signal, TX_DAC generated by MAKO IC. The final TX_DAC value determines the transmit power level and is a factory tuned parameter which is stored inside the codeplug.

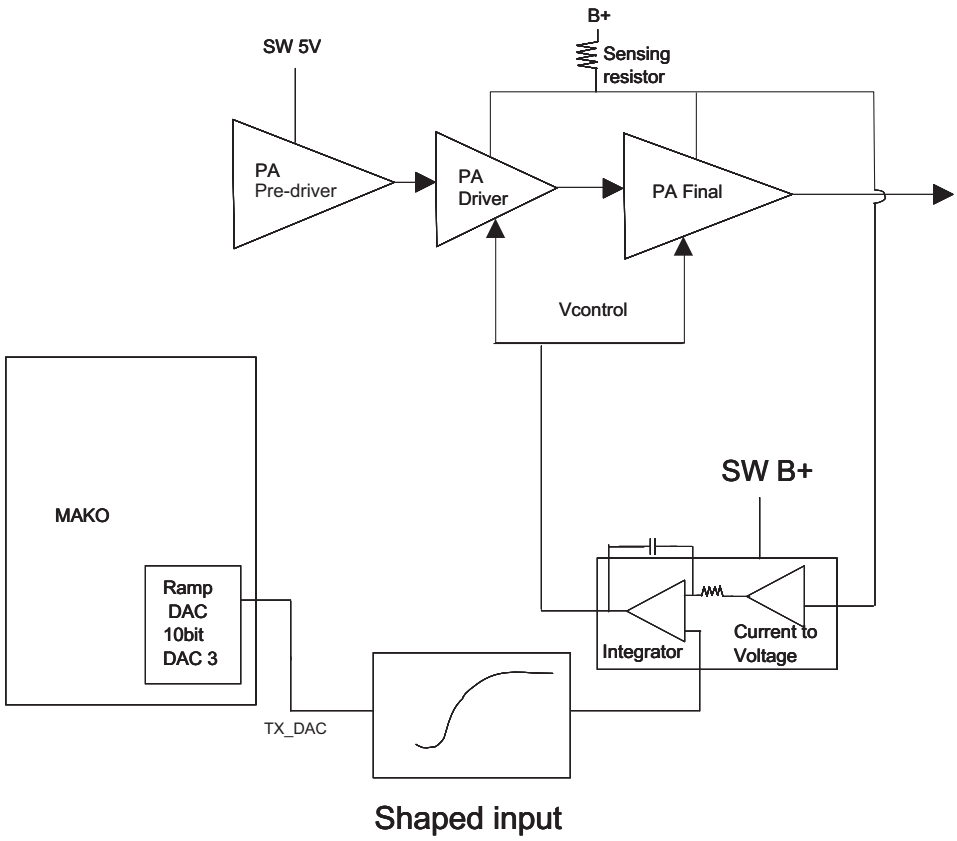


Figure 6-2: Power Control Scheme Basic Block Diagram

2.0 Receiver

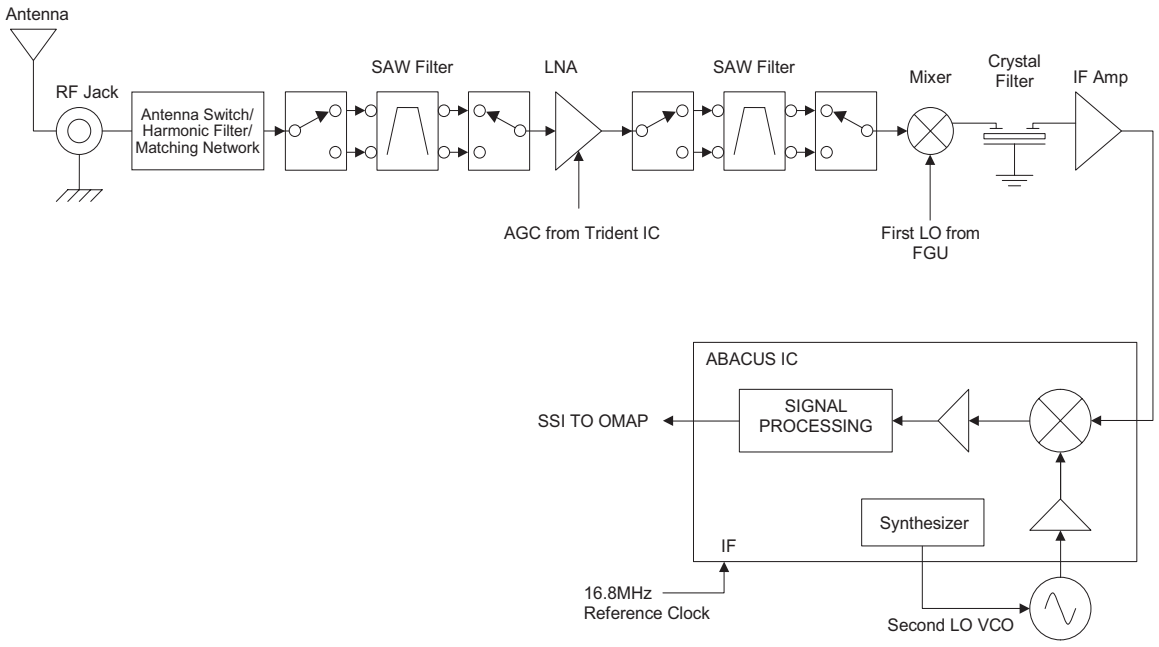


Figure 6-3: 800/900 Receiver Block Diagram

2.1 Receiver Front-End

The RF signal is received via the antenna and applied to a low-pass filter. For 800/900MHz, the filter consists of C902, C904, C905 and L901. The filtered RF signal is passed through the antenna switch and then applied to a pre-filter. The pre-filter comprises of a SAW filter FL401 located in between of 2 GaAs switches U400 and U403. The input and output of the GaAs switches are 50 Ohm points. The SAW filter is a 2 in 1 filter which provides large attenuation at image, half IF and other out-band frequencies.

The pre-filter does not need tuning by the Trident IC. Depending on the carrier frequency, the Trident IC will enable the control line of the GaAs switches to feed the signal either 800MHz or 900MHz to and from the SAW filter.

The output of the pre-filter is passed through a RF step attenuator (D400) to limit the amount RF power fed into the LNA (U400). After being amplified, the RF signal is further filtered by a post-filter. The pre and post filter are identical. The post-filter consists of U404, U405 and FL402. The post-filter does not need any tuning by the Trident IC as well.

The output of the second bandpass filter is passed to a mixer. The mixer is a passive silicon monolithic double balanced mixer (U401). After mixing with the first LO signal from the voltage control oscillator (VCO) using high side injection (for 800MHz) or low side injection (for 900MHz), the RF signal is down converted to the 73.35 MHz IF signal. The 50 Ohm matching for the mixer at the LO input port is provided by C431 and L414.

The IF signal coming out of the mixer is applied to the crystal filter (FL400) through a resistor pad and a diplexer (L411 and C427). Matching to the input of the crystal filter is provided by L412 and C428. The crystal filter provides the necessary adjacent channel selectivity and inter-modulation protection.

The output of the crystal filter (FL400) is matched to the input of the IF amplifier transistor by C432, C433, L415 and L416. Voltage supply to the IF amplifier is 5V_RX, taken from RX VCO. The IF amplifier provides a gain of 28 dB. The IF amplifier output provides a 50 Ohm matched at the IF amplifier output to ABACUS (U600) pin 47 via L418 and C446.

2.2 Receiver Back-End

ABACUS (U600) is tuned via software at radio start-up. The IF signal applied to pin 47 of U600 is down-converted to a second IF of 2.25 MHz. The second IF of 2.25 MHz will then be fed into an ADC, generating the Is and Qs data. This data is in the form of SSI (Serial Synchronous Interface) at pin 29 of U600, which will then be sent to the DSP (OMAP1710) for further processing.

The second VCO is a Colpitts oscillator built around transistor Q602. The VCO has a varactor diode, D600 to adjust the VCO frequency. The second LO frequency could either be 71.1 MHz or 75.6 MHz, depending on the system requirement. The control signal is derived from a loop filter consisting of C617, C618, C619, R605 and R606. The RSSI circuitry is achieved via software programming.

3.0 Frequency Generation Circuitry

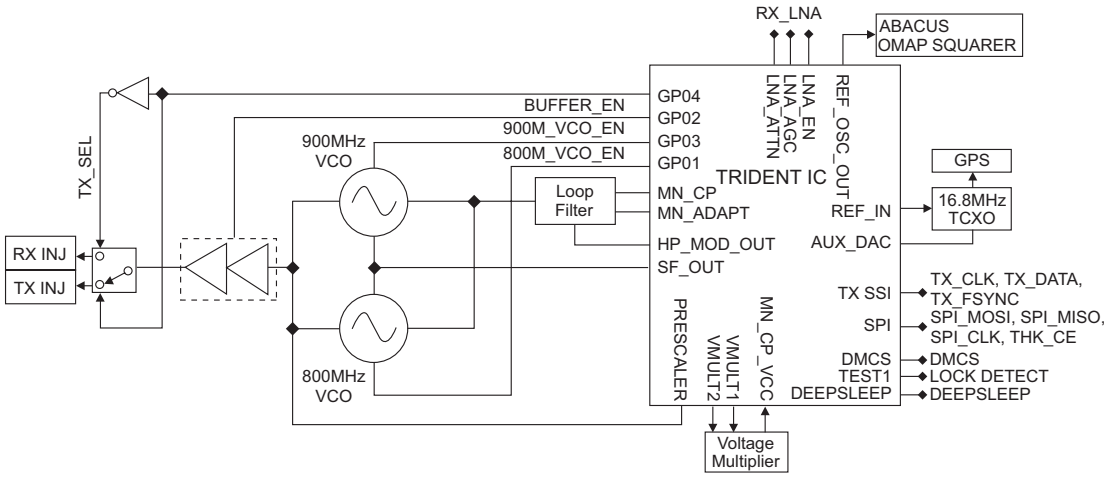


Figure 6-4: Frequency Generating Unit Block Diagram

The Frequency Generating Unit is centered on one main IC, Trident (U001). The modulation data is sent to the synthesizer through 3 TX SSI lines. The block diagram illustrates the interconnect and support circuitry used in the Frequency Generating Unit. Refer to the relevant schematics for the reference designators.

The synthesizer is powered from 2.8V ANA, 2.8V DIG, 1.875V DIG and 5V ANA supplied from U3000-1. The synthesizer in turns generates a superfiltered 4.5V which powers up the 800MHz & 900MHz VCO while a cascaded buffer is powered by 5V VBUS2.

In addition to the VCO, the synthesizer interfaces with the microcontroller. Programming of the synthesizer is accomplished through the 4 lines; SPI_MISO, THK_CE, SPI_MOSI and SPI_CLK via pin D10, D8, D9 and D11 respectively. A 1.875V dc signal from the synthesizer lock detect line indicates to the microprocessor that the synthesizer is locked.

U001 has dual port modulation capability. The microprocessor supplies low port and high port words to pin F11 of U001. For high port modulation, the audio runs through an internal attenuator for modulation balancing purpose before it goes out to the loop filter via pin L9. For the low port modulation, the audio is fed into the main synthesizer, where it is summed with the main_num channel frequency word, then supplied to the accumulator of the Fractional-N synthesizer before going out to the VCO.

3.1 Synthesizer

U001 uses a 16.8 MHz crystal (Y001) to provide a reference for the system. Together with R001, R002, C010, C011, C012 and C043, they build up the reference oscillator which is capable of 0.5ppm stability over temperature of -30ºC to 85 ºC. It also provides 16.8MHz at pin J11 of U001 to be used by ABACUS. The loop filter which consists of R007, R008, R009, C021, C023, C024, C025, C026, C027 and C028 provides the necessary dc steering voltage for the VCO and determines the amount of noise and spur passing through.

For achieving fast locking for the synthesizer, an internal adapt charge pump provides higher current (~10mA) at pin G2. The required frequency is then locked by normal mode charge pump at pin G3. Both normal and adapt charge pumps get 12V supply from the voltage multiplier circuit that consists of D002, D003, C031, C032, C033, C034, C035 and C036.

3.2 VCO - Voltage Controlled Oscillator

Each VCO in conjunction with the synthesizer generates RF injection signal for both receive and transmit modes of operation. The 800MHz VCO comprises of a Colpitts oscillator built around Q203. Vcontrol is supplied to back-to-back varactors (D200 and D201). The LC tank comprises of C207 and L202. Similarly in 900MHz VCO which is also a Colpitts oscillator built around Q204 with LC tank, C222 and L208. Vcontrol is supplied to back-to-back varactors (D204 and D205). Both oscillators are supplied with a 4.5V super-filtered supply from the synthesizer, U001 through a RF switch that consists of Q200, Q201, C200, C201, C202 and C203.

A common cascaded buffer, built up of a buffer IC, U200 cascaded with a discrete transistor built around Q205 with a switched attenuator at input of buffer IC is supplied with a 5V ANA supply from MAKO, U3000-1. A switchable attenuator is placed at the input of the Buffer IC. In the Tx mode the input power to the IC is reduced by turning on the switchable attenuator implemented, with a PIN diode D202. The receiver mixer requires a higher injection power than than the transmitter. A lower transmit power improves isolation between VCO and transmitter amplifiers. The output of the cascaded buffer is matched to 50Ohms by C246, C247, C248, L217 and L218 then switched between RX and TX through an RF switch i.e. U201 providing output power level of 6dBm to RX_1ST_LO_INJ and output power level of 3dBm to TX_BUFF.

4.0 Global Positioning System (GPS) Receiver

The GPS device is an embedded receiver that provides the location of the subscriber in terms of latitude, longitude, velocity, direction and altitude.

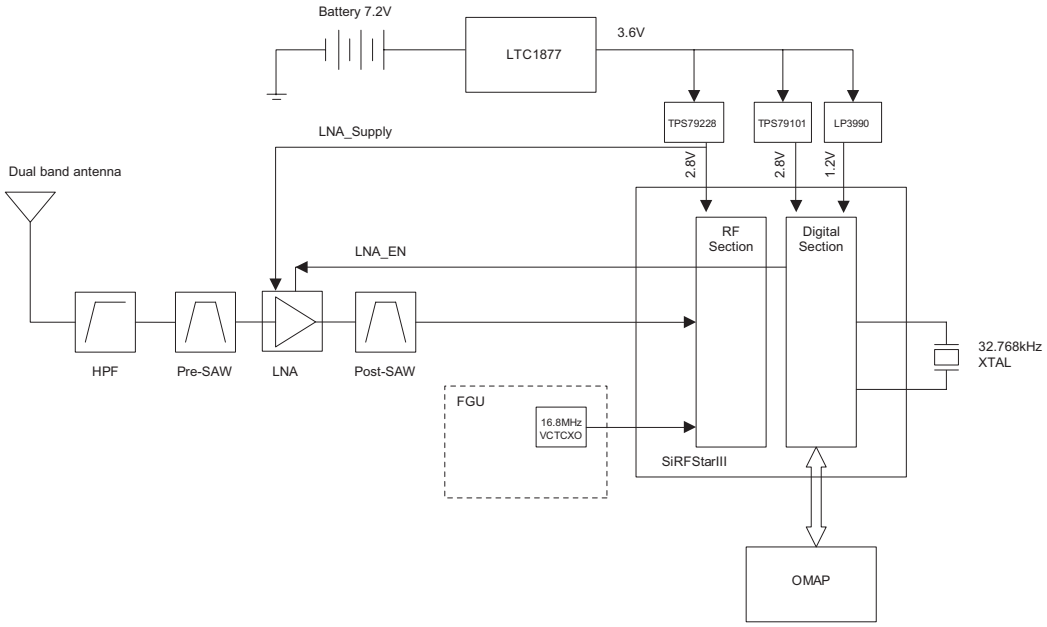


Figure 6-5: GPS Receiver Block Diagram

The RF signal is received by the antenna and applied to a high-pass filter. The filter consists of C924, C925, C926, L912 and L913. The filtered RF signal is then applied to a SAW filter, FL8001.

The output of the SAW filter is fed into the LNA (U8001). The LNA biasing is controlled by SIRF_LNA_EN (pin A4 of the GPS IC, U8000). The LNA input match comprises of C8013, C8014 and L8001. The LNA output match comprises of L8003 and C8017. After being amplified, the RF signal is further filtered by a second SAW filter, FL8002.

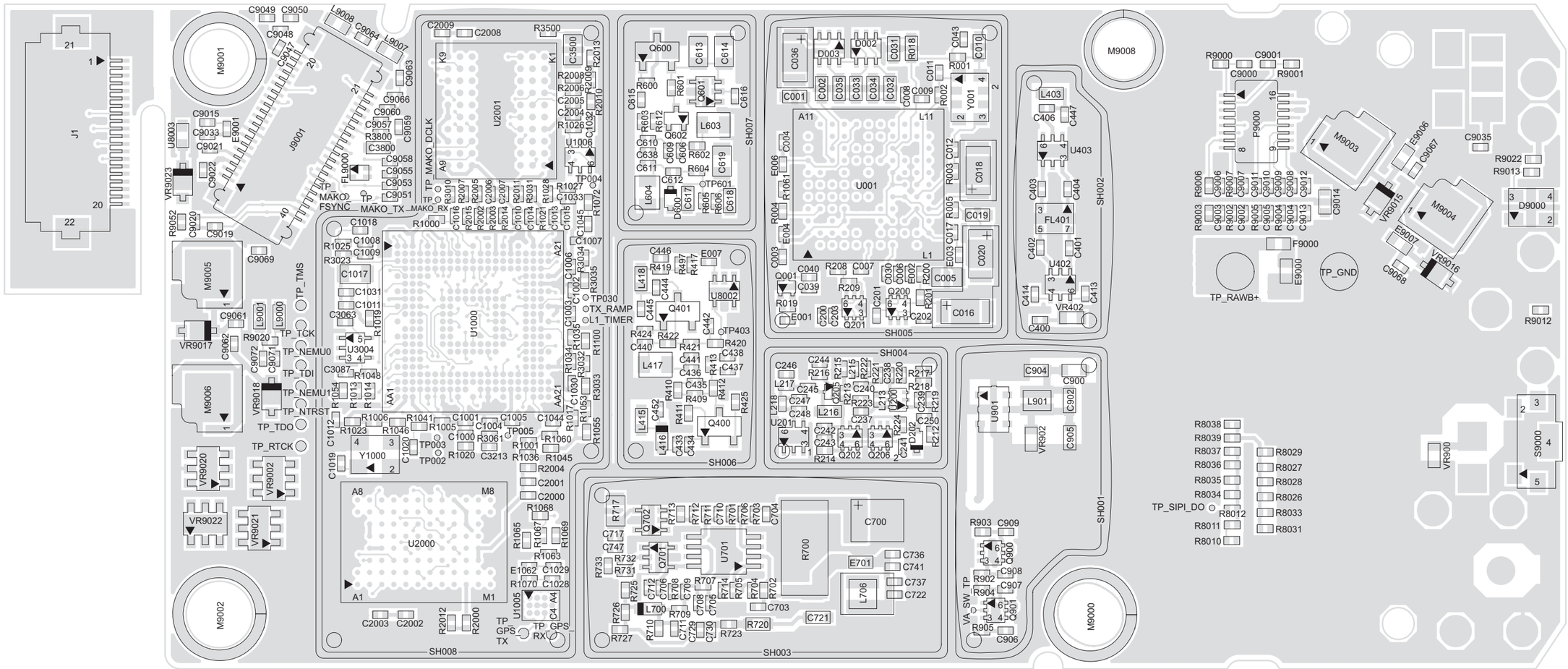
The output of the second SAW filter is passed to pin P6 of the GPS IC. The input match for pin P6 comprises of C8018, C8019 and L8004. The control and data lines for the GPS IC are GPS_nRESET, GPS_ON_OFF, GPS_TX, GPS_RX and GPS_BOOT. GPS_nWAKEUP line is fed into the microcontroller to indicate the state (full power or hibernate state) of the GPS IC so that the microcontroller will never trigger a GPS_ON_OFF when the GPS IC is in full power state.

A dedicated 32.768kHz quartz crystal oscillator (Y8000) is used to provide RTC clock to the RTC circuit inside the GPS IC. The second input frequency is a 16.8MHz reference, used by the StarIII to synthesize the internal LO. This reference will be supplied by a VCTCXO (Y001) located in the synthesizer block, which will be shared by the Trident.

The GPS IC is powered by 2.8V_DIG_GPS, 2.8V_RF_GPS and 1.2V_GPS_RTC supplied from 3 discrete external regulators (U3701, U3700 & U3006). The input of these regulators is sourced from a switching regulator (U3020) which regulates the SWB+ to 3.6V.

Notes

5.0 Circuit Board/Schematic Diagrams and Parts List


J1
M9001
J9001
U2001
U1000
U2000
U001
U701
U1005
U8003
U8002
U3004
U1006
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U403
U901
M9002
M9003
M9004
M9005
M9006
M9008
M9000
SH001
SH002
SH003
SH004
SH005
SH006
SH008
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TP_TCK
TP_NEMU0
TP_TDI
TP_NEMU1
TP_NTRST
TP_TDO
TP_RTCK
TP_MAKO_DCLK
MAKO_FSYNC
MAKO_TX
MAKO_RX
TP_GPS_TX
TP_GPS_RX
TX_RAMP
L1_TIMER
TP_RAWB+
TP_GND
TP_SIPI_DO
VA_SW_TP
Y1000
FL9000
FL401
VR9017
VR9018
VR9020
VR9002
VR9022
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VR9023
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L218
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L418
L415
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E9006
E9007
F9000
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TP002
TP003
TP004
TP005
TP403
TP601
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C1004
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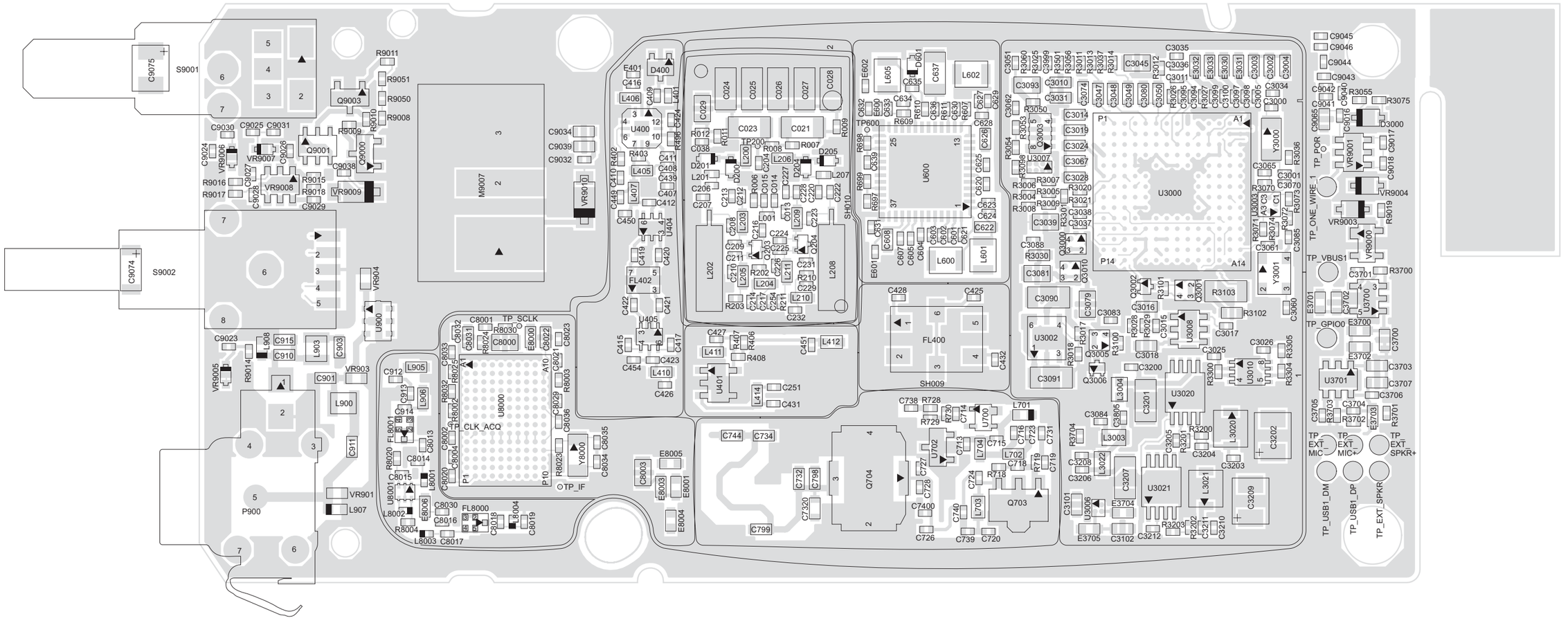
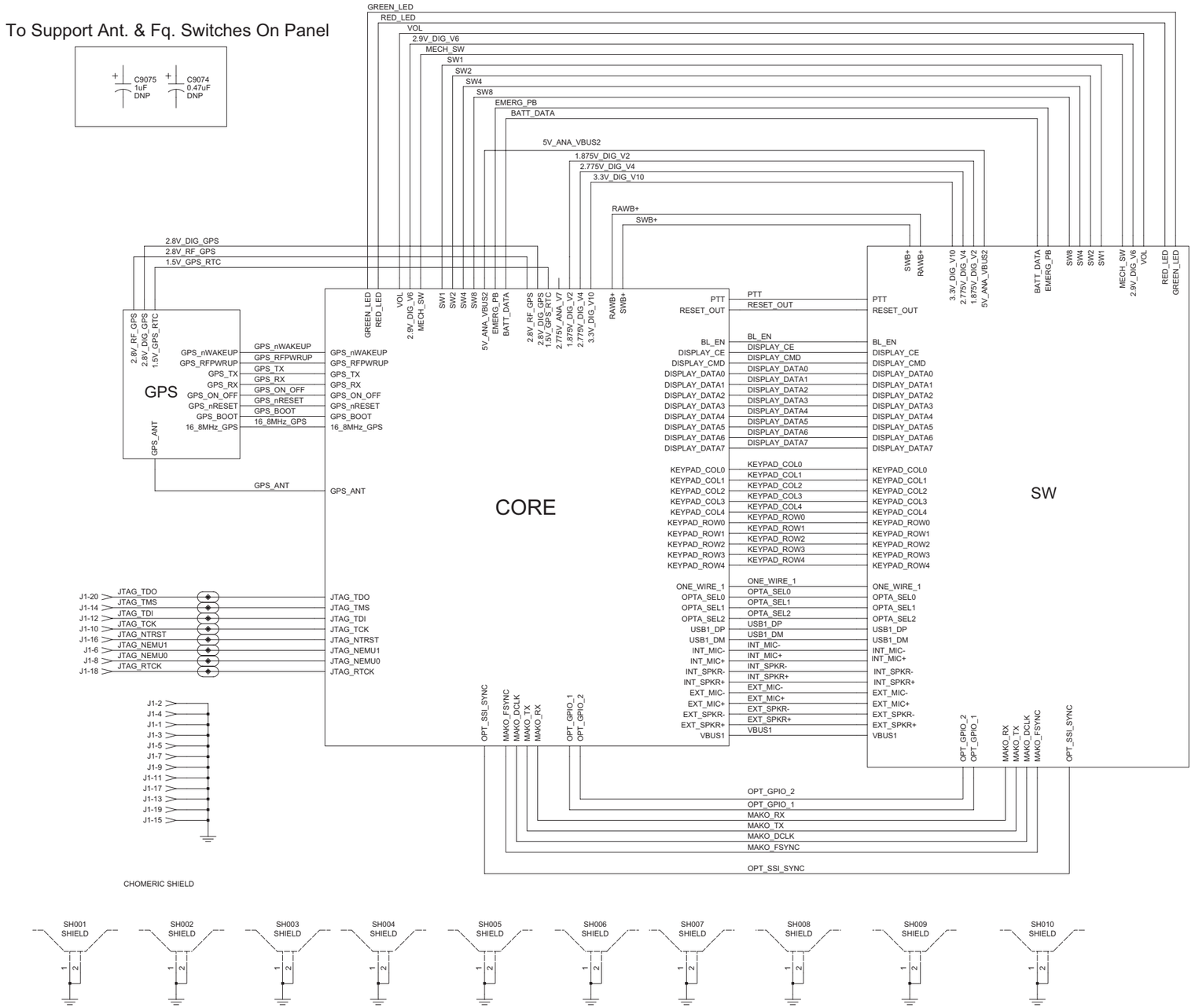
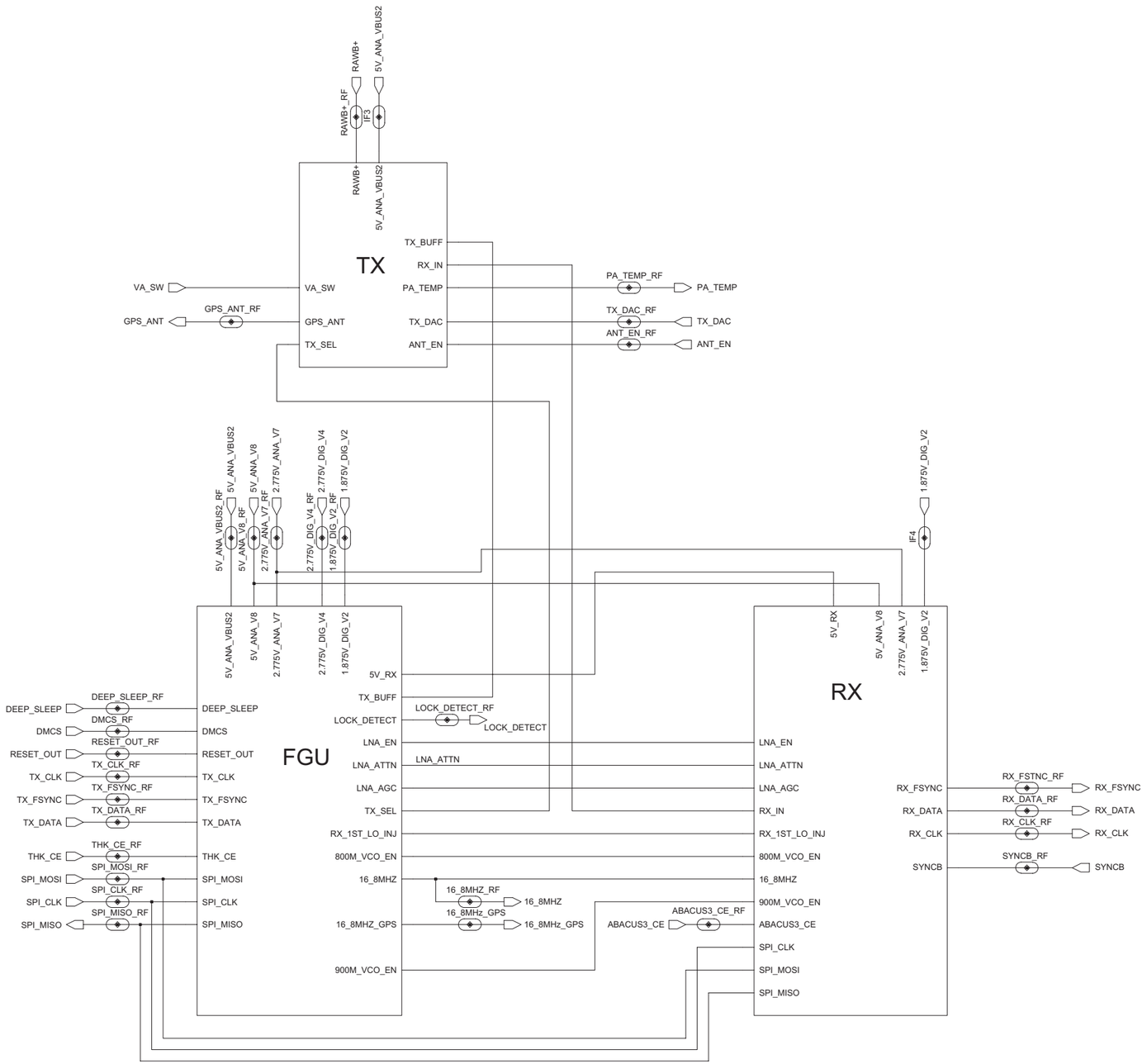
C1112



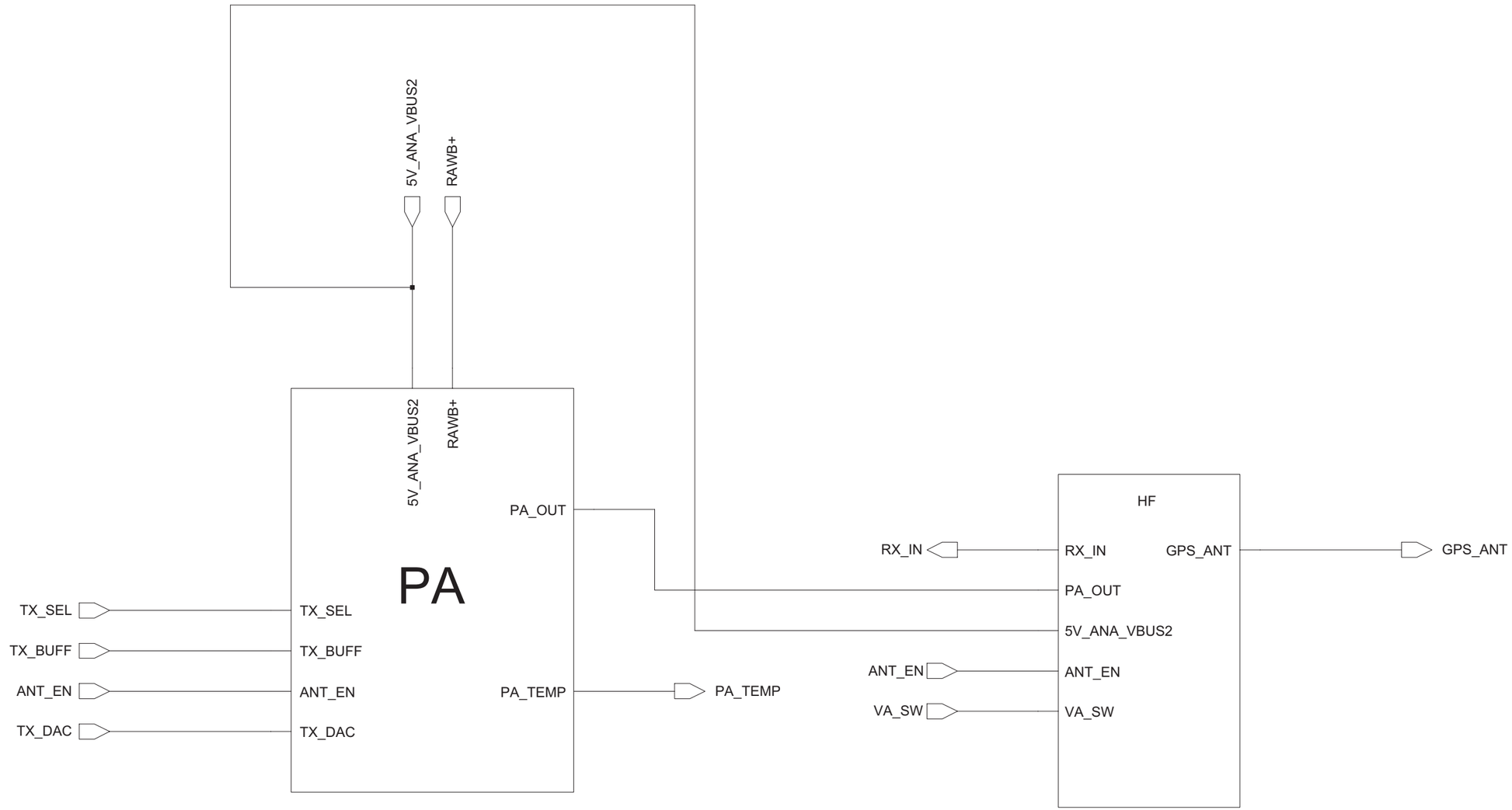
Main Board Bottom Side PCB No. 8478056A01



Complete Radio Schematic Diagram

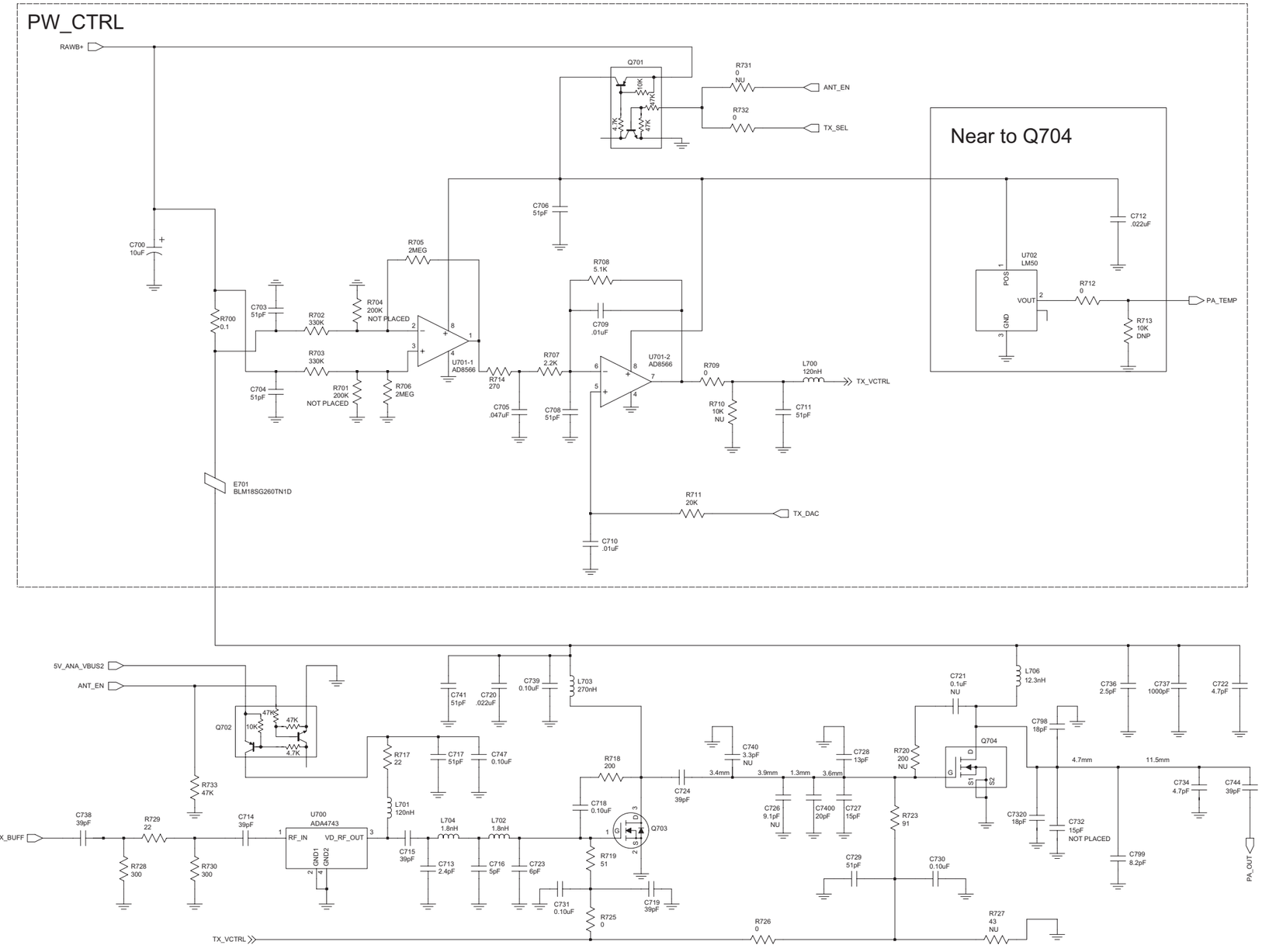


Complete RF Schematic Diagram

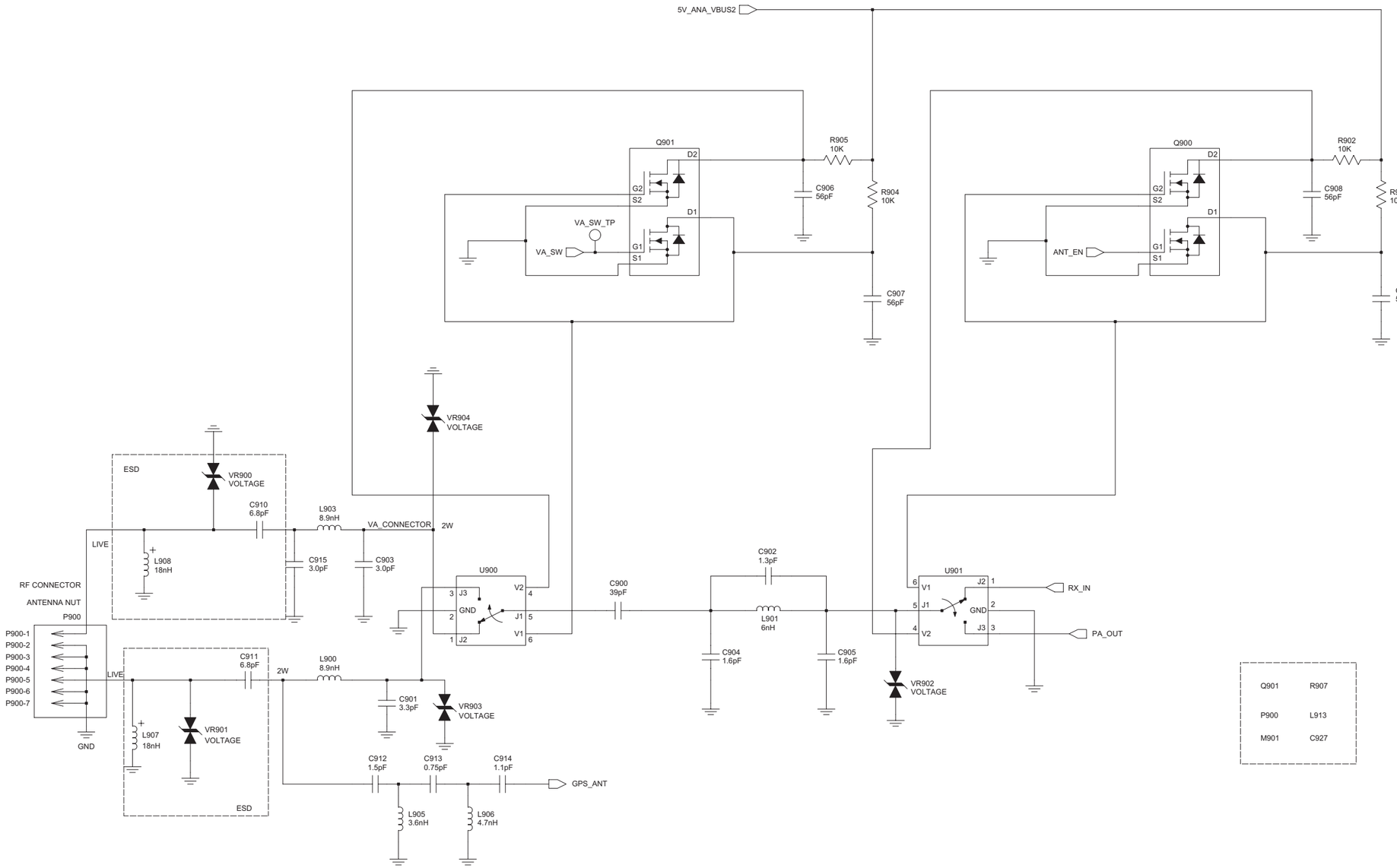


Complete Transmitter Schematic Diagram

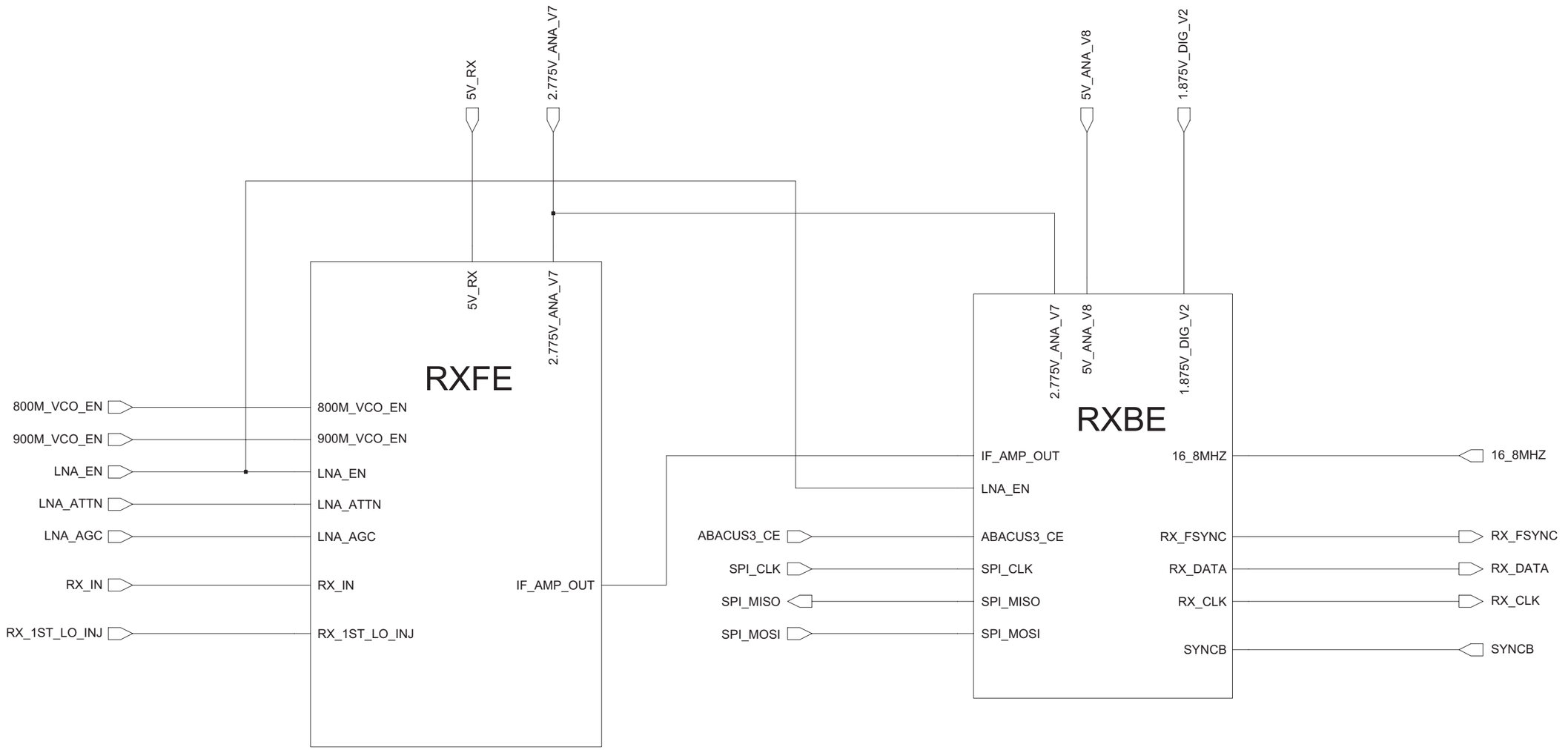
PA



Transmitter Schematic Diagram

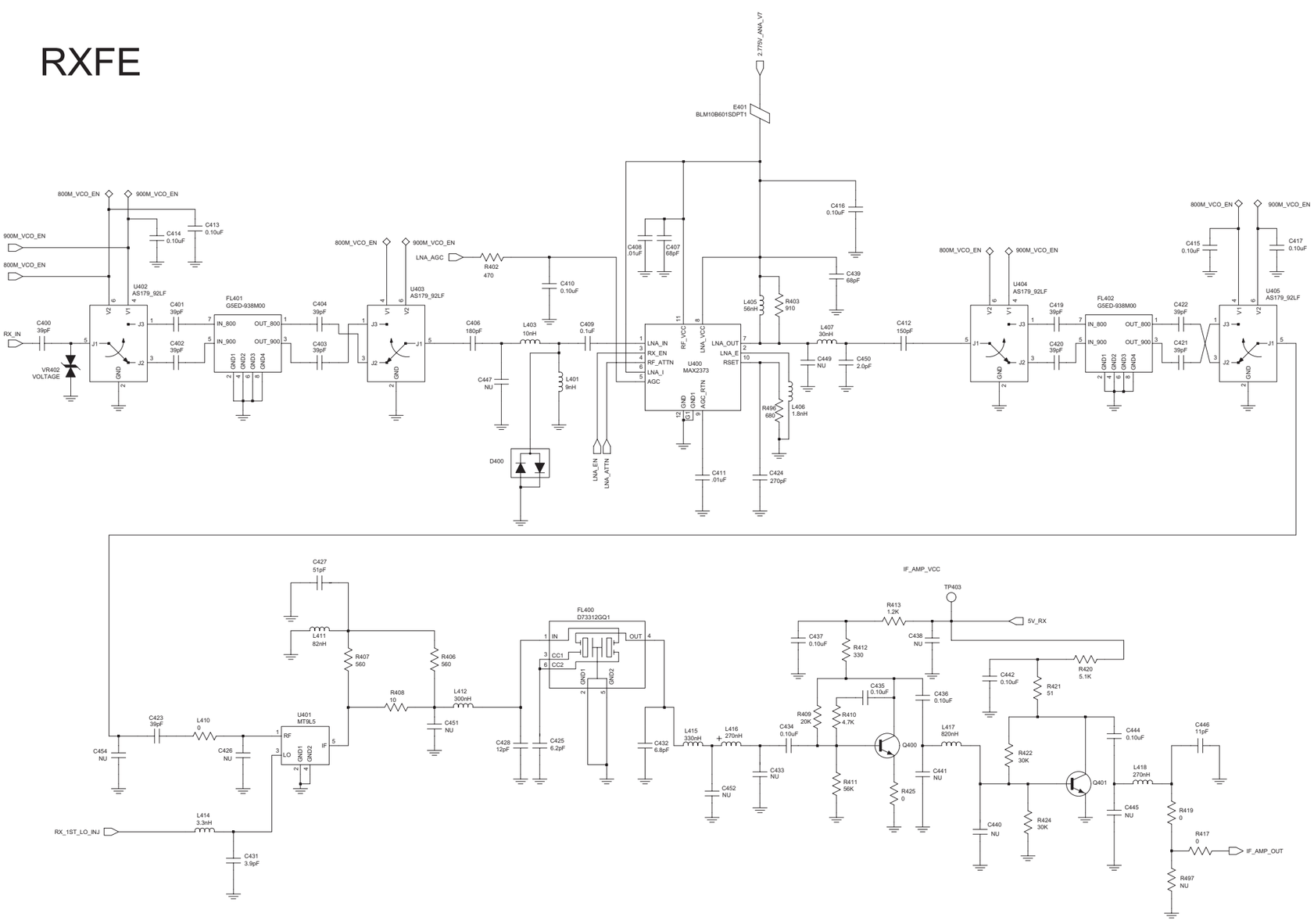


Harmonic Filter and Antenna Switch Schematic Diagram

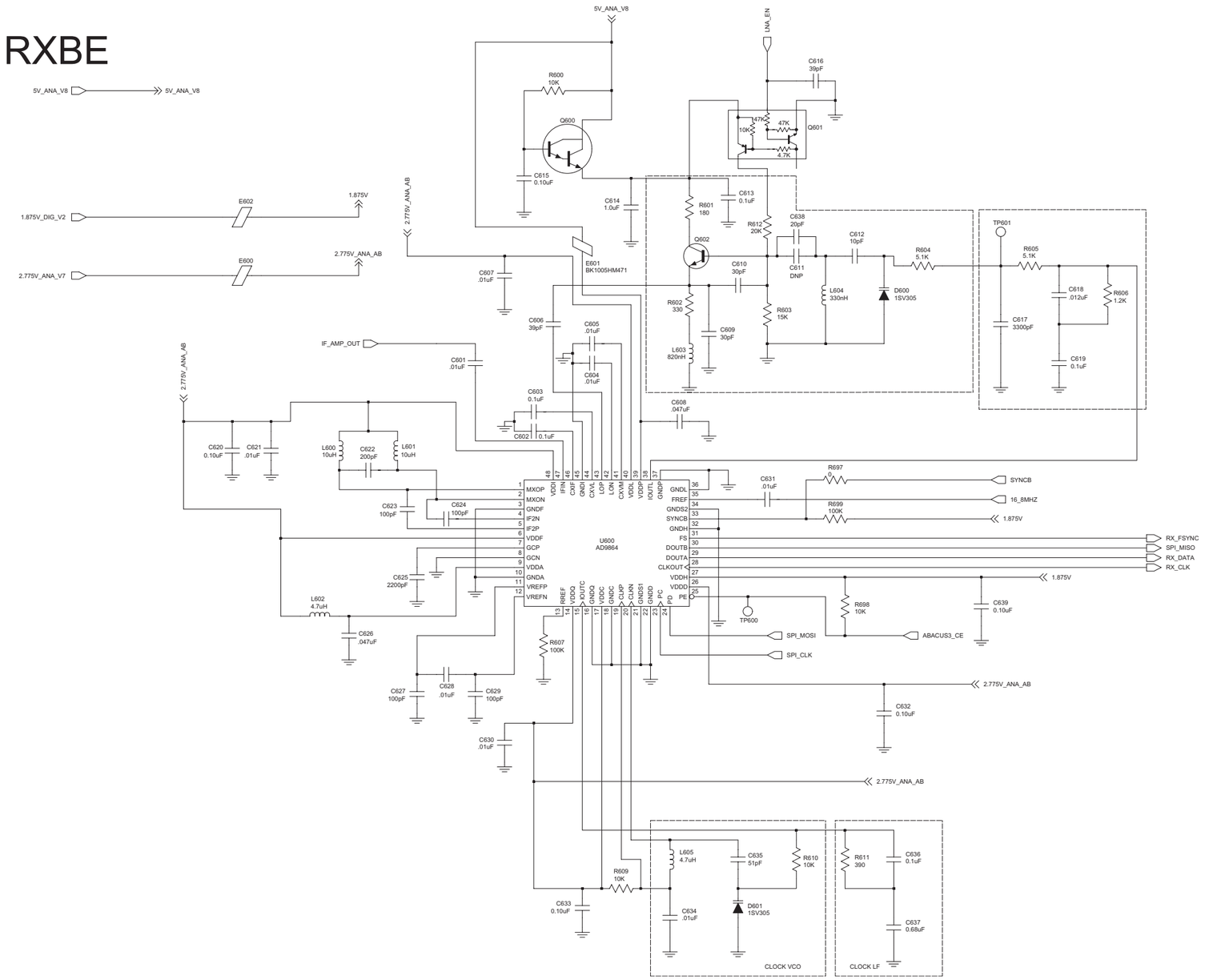


Complete Receiver Schematic Diagram

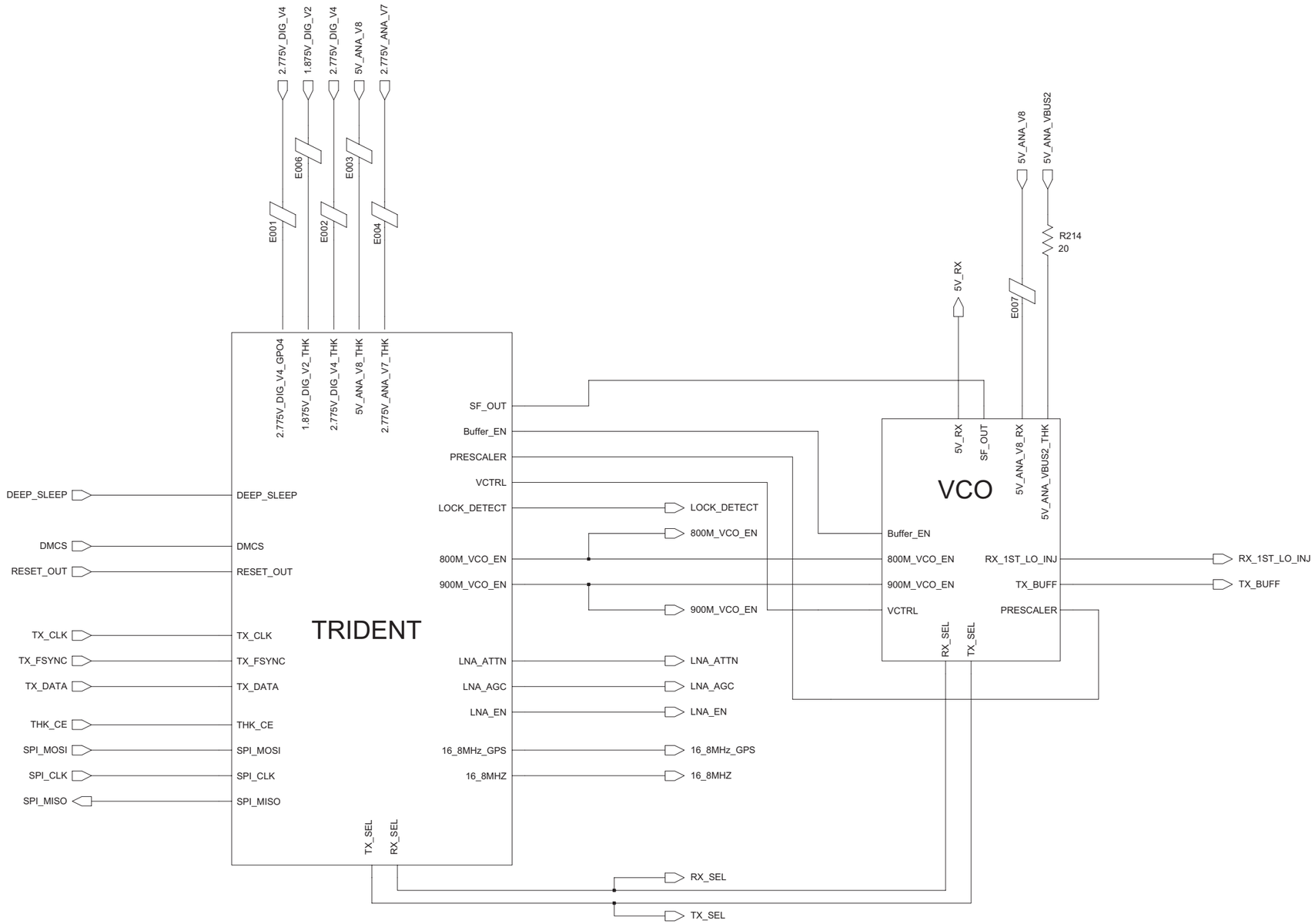
RXFE



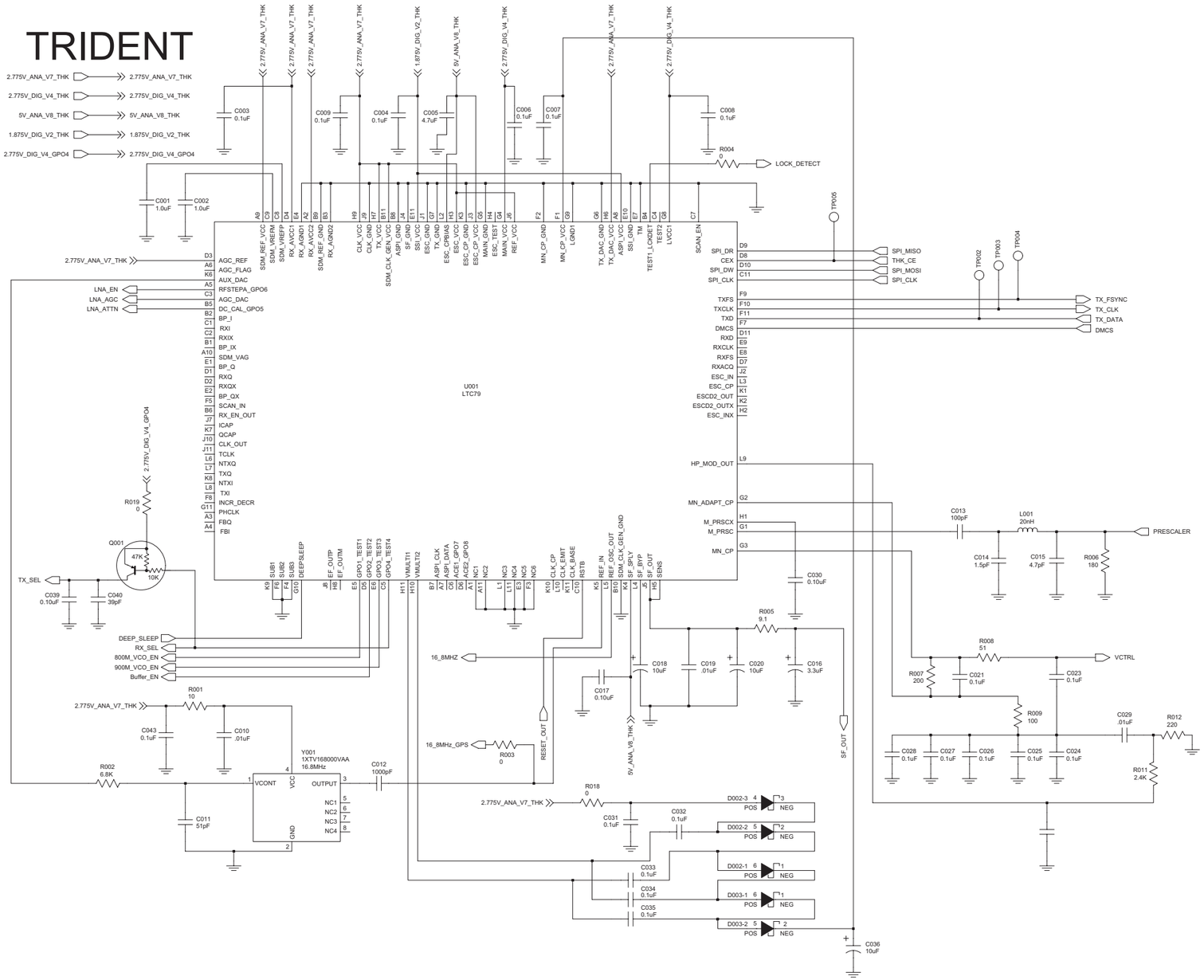
Receiver Front End Schematic Diagram



Receiver Back End Schematic Diagram

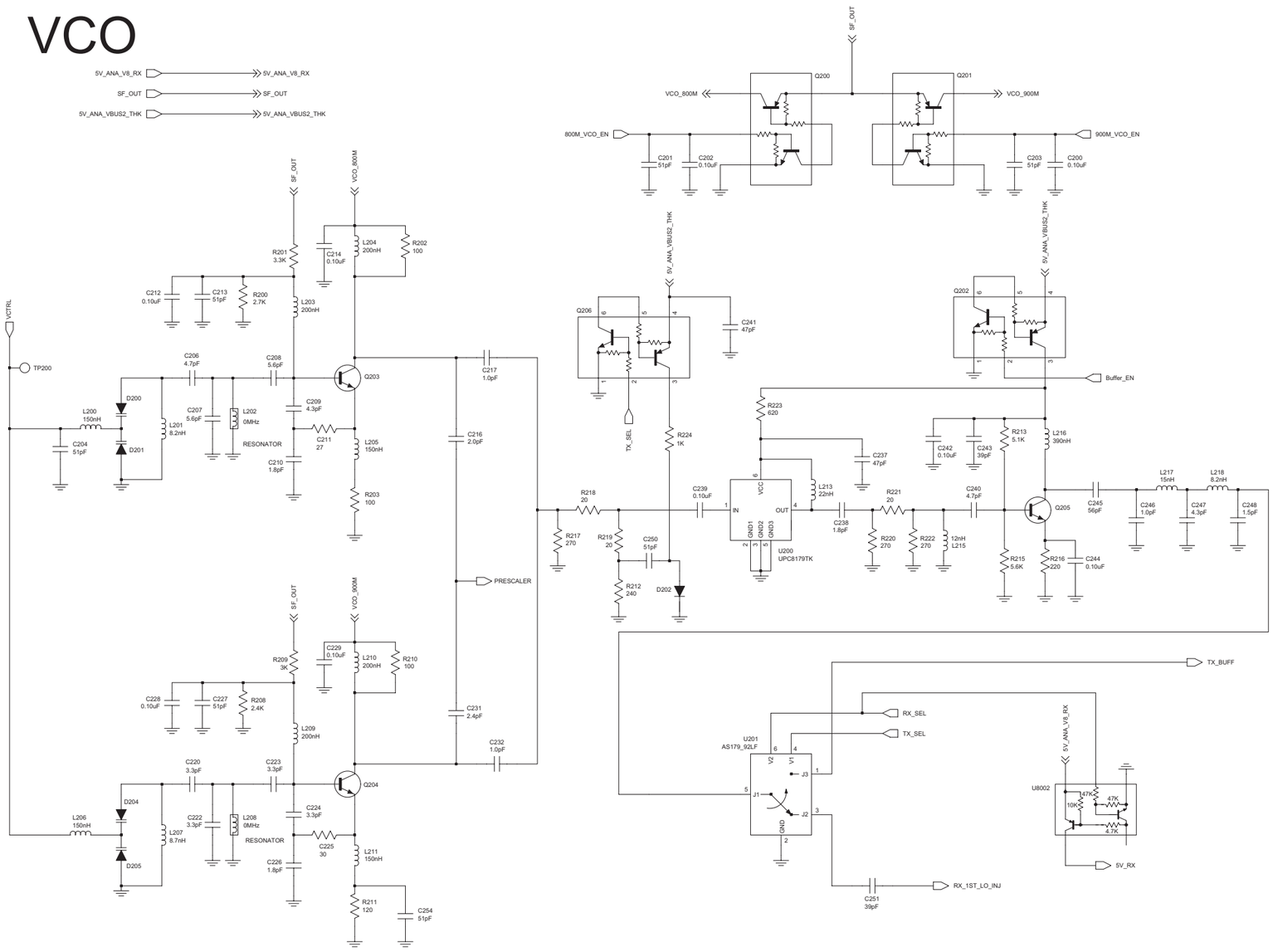


Complete Frequency Generating Unit Schematic Diagram



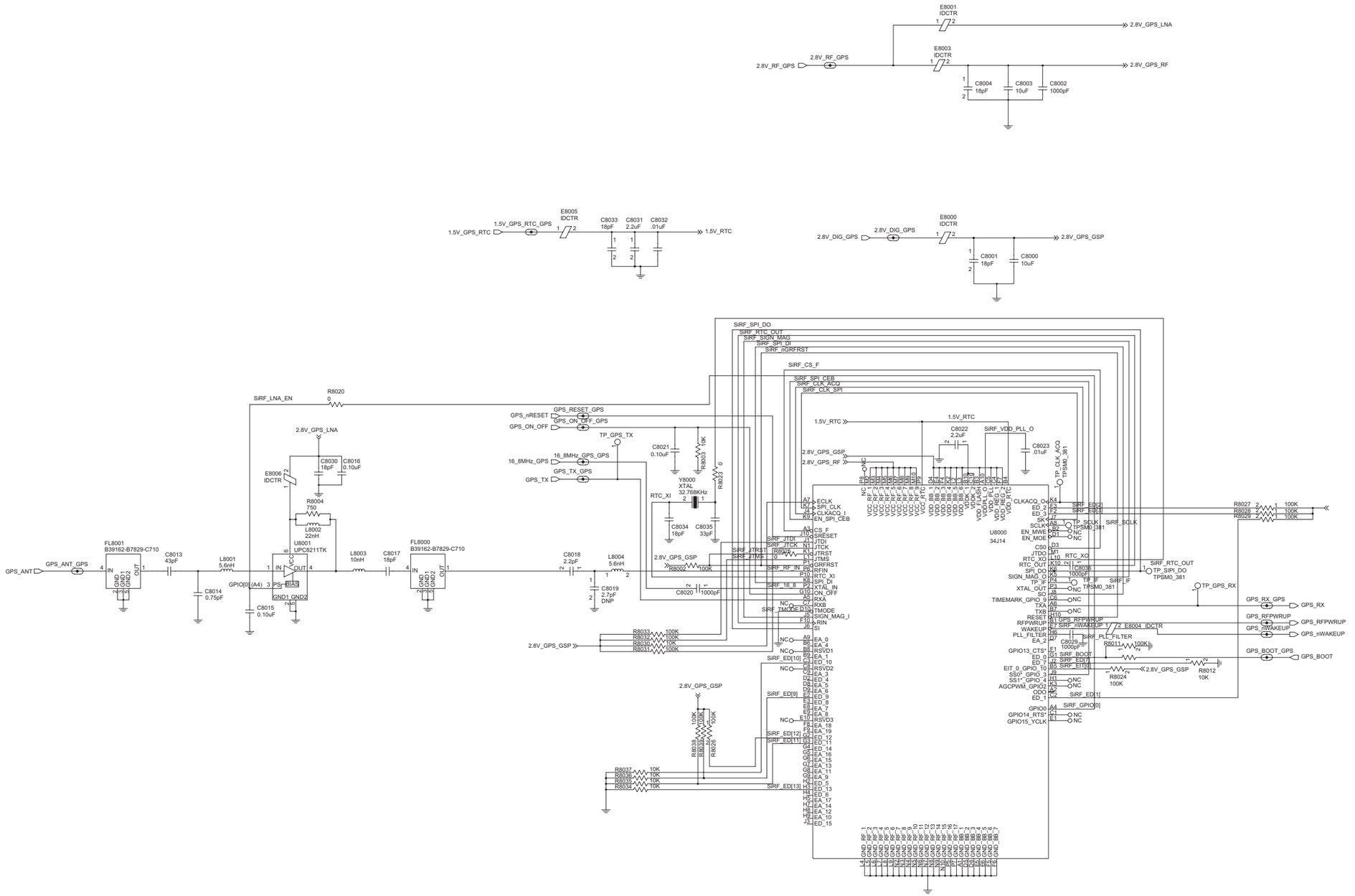
Synthesizer Schematic Diagram

VCO



Voltage Controlled Oscillator Schematic Diagram

GPS Block



GPS Block Schematic Diagram

Radio Parts List (8478056A01)

Circuit Ref	Motorola Part No.	Description
C001	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C002	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C003	2113946K02	CAP CER CHP 0.10UF 16V
C004	2113946K02	CAP CER CHP 0.10UF 16V
C005	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C006	2113946K02	CAP CER CHP 0.10UF 16V
C007	2113946K05	CAP,FXD,.47UF,+80%,-20%,16V-DC,0402,Y5V,-30DEG CMIN,85DEG CMAX
C008	2113946K02	CAP CER CHP 0.10UF 16V
C009	2113946K02	CAP CER CHP 0.10UF 16V
C010	2113945L49	CAP,FXD,.01UF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX,P
C011	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C012	2113945A09	CAP CER CHP 1000PF 50V 10%
C013	2115153H47	CAP, CERAMIC, COG
C014	2113944A05	CAP CER CHP 1.5PF 50V +/-0.25PF
C015	2113944A17	CAP CER CHP 4.7PF 50V +/-0.25PF
C016	2313960B54	CAP,FXD,3.3UF,+10%,-10%,6.3V-DC,SM,-55DEG CMIN,125DEG CMAX,104M
C017	2113946K02	CAP CER CHP 0.10UF 16V
C018	2313960B57	CAP,FXD,10UF,+10%,-10%,6.3V-DC,SM,-55DEG CMIN,125DEG CMAX,137MA
C019	2113945L49	CAP,FXD,.01UF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX,P
C020	2313960B57	CAP,FXD,10UF,+10%,-10%,6.3V-DC,SM,-55DEG CMIN,125DEG CMAX,137MA
C021	2185419D06	CAP CER SUPER L/D 0.1UF
C023	2185419D06	CAP CER SUPER L/D 0.1UF
C024	2185419D06	CAP CER SUPER L/D 0.1UF
C025	2185419D06	CAP CER SUPER L/D 0.1UF
C026	2185419D06	CAP CER SUPER L/D 0.1UF
C027	2185419D06	CAP CER SUPER L/D 0.1UF
C028	2185419D06	CAP CER SUPER L/D 0.1UF
C029	2185419D03	CAP CER SUPER L/D 0.01UF
C030	2113946K02	CAP CER CHP 0.10UF 16V
C031	2113945C31	CAP,FXD,.1UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C032	2113945C31	CAP,FXD,.1UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C033	2113945C31	CAP,FXD,.1UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C034	2113945C31	CAP,FXD,.1UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C035	2113945C31	CAP,FXD,.1UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C036	21012020001	10UF, 16V TANTALUM CAP, CASE A
C038	NOTPLACED	
C039	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C040	2115153H47	CAP, CERAMIC, COG
C043	2113946K02	CAP CER CHP 0.10UF 16V
C200	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C201	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C202	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C203	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C204	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C206	2115153H18	CAP, CERAMIC, COG
C207	2115153H21	CAP, CERAMIC, COG
C208	2115153H21	CAP, CERAMIC, COG
C209	2115153H18	CAP, CERAMIC, COG
C210	2115153H09	CAP, CERAMIC, COG
C211	0613952Q35	CER CHIP RES 27.0 OHM 5 0402
C212	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C213	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C214	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C216	2115153H10	CAP, CERAMIC, COG
C217	2115153H03	CAP, CERAMIC, COG
C220	2115153H15	CAP, CERAMIC, COG
C222	2115153H15	CAP, CERAMIC, COG
C223	2115153H15	CAP, CERAMIC, COG
C224	2115153H15	CAP, CERAMIC, COG
C225	0613952Q36	CER CHIP RES 30.0 OHM 5 0402
C226	2115153H09	CAP, CERAMIC, COG
C227	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C228	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C229	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C231	2115153H12	CAP, CERAMIC, COG
C232	2115153H03	CAP, CERAMIC, COG
C237	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C238	2.11E+67	CAP,FXD,.7PF,.02PF+/-,25V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C239	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C240	2115153H19	CAP, CERAMIC, COG
C241	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C242	2113956A51	CAP,FXD,1UF,+10%,-10%,6.3V-DC,0402,X5R,-55DEG CMIN,85DEG CMAX,P
C243	2115153H47	CAP, CERAMIC, COG
C244	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C245	2115153H16	CAP, CERAMIC, COG
C246	2115153H07	CAP, CERAMIC, COG
C247	2115153H15	CAP, CERAMIC, COG
C248	2115153H07	CAP, CERAMIC, COG
C250	2115153H47	CAP, CERAMIC, COG
C251	2115153H47	CAP, CERAMIC, COG
C254	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C400	2113944A32	CAP CER CHP 39.0PF 50V 5%
C401	2113944A32	CAP CER CHP 39.0PF 50V 5%
C402	2113944A32	CAP CER CHP 39.0PF 50V 5%
C403	2113944A32	CAP CER CHP 39.0PF 50V 5%
C404	2113944A32	CAP CER CHP 39.0PF 50V 5%
C406	2113944A43	CAP CER CHP 180.0PF 50V 5%
C407	2113944A36	CAP CER CHP 68.0PF 50V 5%
C408	2113945B02	CAP CER CHP 10,000PF 25V 10%
C409	2113946B04	CAP CER CHP 0.10UF 10V 10%

Circuit Ref	Motorola Part No.	Description
C410	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C411	2113945B02	CAP CER CHP 10,000PF 25V 10%
C412	2113944A42	CAP CER CHP 150.0PF 50V 5%
C413	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C414	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C415	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C416	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C417	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C419	2113944A32	CAP CER CHP 39.0PF 50V 5%
C420	2113944A32	CAP CER CHP 39.0PF 50V 5%
C421	2113944A32	CAP CER CHP 39.0PF 50V 5%
C422	2113944A32	CAP CER CHP 39.0PF 50V 5%
C423	2113944A32	CAP CER CHP 39.0PF 50V 5%
C424	2113944A45	CAP CER CHP 270.0 PF 50V 5%
C425	2113944A20	CAP CER CHP 6.2PF 50V +/- 0.5PF
C426	NOTPLACED	
C427	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C428	2113944A26	CAP CER CHP 12.0PF 50V 5%
C431	2113944A15	CAP CER CHP 3.9PF 50V +/- 0.25PF
C432	2113944A26	CAP CER CHP 12.0PF 50V 5%
C433	2115153H38	CAP, CERAMIC, COG
C434	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C435	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C436	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C437	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C438	NOTPLACED	
C439	2113944A36	CAP CER CHP 68.0PF 50V 5%
C440	NOTPLACED	
C441	NOTPLACED	
C442	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C444	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C445	NOTPLACED	
C446	2113944A77	CAP,FXD,11PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C447	NOTPLACED	
C449	NOTPLACED	
C450	2113944A08	CAP CER CHP 2.0PF 50V +/- 0.25PF
C451	NOTPLACED	
C452	2113944A19	CAP CER CHP 5.6PF 50V +/- 0.5PF
C454	NOTPLACED	
C601	2113945B02	CAP CER CHP 10,000PF 25V 10%
C602	2113946B04	CAP CER CHP 0.10UF 10V 10%
C603	2113946B04	CAP CER CHP 0.10UF 10V 10%
C604	2113945B02	CAP CER CHP 10,000PF 25V 10%
C605	2113945B02	CAP CER CHP 10,000PF 25V 10%
C606	2113944A32	CAP CER CHP 39.0PF 50V 5%
C607	2113945B02	CAP CER CHP 10,000PF 25V 10%
C608	2113945D02	CAP CER CHP 47,000PF 25V 10%
C609	2115153H44	CAP, CERAMIC, COG
C610	2115153H44	CAP, CERAMIC, COG
C611	NOTPLACED	
C612	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C613	2113945G91	CAP,FXD,.1UF,+10%,-10%,50V-DC,0805,X7R,-55DEG CMIN,125DEG CMAX
C614	2.11E+08	CAP CER CHP 1.0UF 16V 10%
C615	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C616	2113944A32	CAP CER CHP 39.0PF 50V 5%
C617	2113945L37	CAP,FXD,3300PF,+5%,-5%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMAX
C618	2113945C18	CAP,FXD,.012UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C619	2185419D28	CAP,CERAMIC CHIP,.1UF,,+10%,-10%,10
C620	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C621	2113945B02	CAP CER CHP 10,000PF 25V 10%
C622	2113944C89	CAP,FXD,200PF,+5%,-5%,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,P
C623	2113944A40	CAP CER CHP 100.0PF 50V 5%
C624	2113944A40	CAP CER CHP 100.0PF 50V 5%
C625	2113945A11	CAP CER CHP 2200PF 50V 10%
C626	2113945D02	CAP CER CHP 47,000PF 25V 10%
C627	2113944A40	CAP CER CHP 100.0PF 50V 5%
C628	2113945B02	CAP CER CHP 10,000PF 25V 10%
C629	2113944A40	CAP CER CHP 100.0PF 50V 5%
C630	2113945B02	CAP CER CHP 10,000PF 25V 10%
C631	2113945B02	CAP CER CHP 10,000PF 25V 10%
C632	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C633	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C634	2113945B02	CAP CER CHP 10,000PF 25V 10%
C635	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C636	2113946B04	CAP CER CHP 0.10UF 10V 10%
C637	2113946G04	CAP,FXD,.68UF,+10%,-10%,16V-DC,1206,X5R,-55DEG CMIN,85DEG CMAX
C638	2115153H40	CAP, CERAMIC, COG
C639	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C700	2316410H03	EPP POSCAP
C703	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C704	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C705	2113946B02	CAP CER CHP 0.047UF 10V 10,

Circuit Ref	Motorola Part No.	Description
C706	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C708	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C709	2113945B02	CAP CER CHP 10,000PF 25V 10%
C710	2113945B02	CAP CER CHP 10,000PF 25V 10%
C711	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C712	2113945B04	CAP,FXD,.022UF,+10%,-10%,25V-DC,0402,X7R,-55DEG CMIN,125DEG CMA
C713	2113944A10	CAP CER CHP 2.4PF 50V +/-0.25PF
C714	2113944A32	CAP CER CHP 39.0PF 50V 5%
C715	2113944A32	CAP CER CHP 39.0PF 50V 5%
C716	2113944A68	CAP,FXD,5PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,P
C717	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C718	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C719	2113944A32	CAP CER CHP 39.0PF 50V 5%
C720	2113945B04	CAP,FXD,.022UF,+10%,-10%,25V-DC,0402,X7R,-55DEG CMIN,125DEG CMA
C721	NOTPLACED	
C722	2113944A17	CAP CER CHP 4.7PF 50V +/-0.25PF
C723	2113944A70	CAP,FXD,6PF,.5PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C724	2113944A32	CAP CER CHP 39.0PF 50V 5%
C726	NOTPLACED	
C727	2115153H37	CAP, CERAMIC, COG
C728	2115153H36	CAP, CERAMIC, COG
C729	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C730	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C731	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C732	NOTPLACED	
C734	2113944M10	CAP,FXD,4.7PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C736	2113944A64	CAP,FXD,2.5PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C737	2113945A09	CAP CER CHP 1000PF 50V 10%
C738	2113944A32	CAP CER CHP 39.0PF 50V 5%
C739	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C740	NOTPLACED	
C741	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C744	2113944C37	CAP CER CHP 39.0PF 50V 5%
C747	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C798	2175662M06	CAPACITOR, CERAMIC, 2% 100/50V
C799	2113944M16	CAP,FXD,8.2PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C900	2113944C37	CAP CER CHP 39.0PF 50V 5%
C901	2113944M06	CAP,FXD,3.3PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C902	2113944C66	CAP,FXD,1.3PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C903	2113944M05	CAP,FXD,3PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C904	2113944C68	CAP,FXD,1.6PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C905	2113944C68	CAP,FXD,1.6PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C906	2113944A34	CAP CER CHP 56.0PF 50V 5%
C907	2113944A34	CAP CER CHP 56.0PF 50V 5%
C908	2113944A34	CAP CER CHP 56.0PF 50V 5%
C909	2113944A34	CAP CER CHP 56.0PF 50V 5%
C910	2113944M14	CAP,FXD,6.8PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C911	2113944M14	CAP,FXD,6.8PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX
C912	2113944A05	CAP CER CHP 1.5PF 50V +/-0.25PF
C913	2113944A62	CAP,FXD,.75PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C914	2113944A01	CAP CER CHP 1.1PF 50V +/-0.25PF
C915	2113944M05	CAP,FXD,3PF,.1PF+/-,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C1000	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C1001	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1002	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1003	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C1004	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C1005	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1006	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1007	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C1008	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C1009	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1010	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1011	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C1012	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1013	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1014	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX

Circuit Ref	Motorola Part No.	Description
C1015	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1016	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1017	2.11E+08	CAP CER CHP 1.0UF 16V 10%
C1018	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C1019	2113944A28	CAP CER CHP 18.0PF 50V 5%
C1020	2113944A28	CAP CER CHP 18.0PF 50V 5%
C1028	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1029	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1030	2113944A28	CAP CER CHP 18.0PF 50V 5%
C1031	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1032	2113945B02	CAP CER CHP 10,000PF 25V 10%
C1033	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1044	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C1045	2113944A33	CAP CER CHP 47.0PF 50V 5%
C2000	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C2001	2113945B02	CAP CER CHP 10,000PF 25V 10%
C2002	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C2003	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C2004	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C2005	2113945B02	CAP CER CHP 10,000PF 25V 10%
C2006	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C2007	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C2008	2189444V01	CAP,FXD,2.2UF,,+20%,-20%,4V-DC,,X5R,-55DEG CMIN,85DEG CMAX
C2009	2189444V01	CAP,FXD,2.2UF,,+20%,-20%,4V-DC,,X5R,-55DEG CMIN,85DEG CMAX
C3000	2113944A78	CAP,FXD,13PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C3001	2113944A78	CAP,FXD,13PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C3002	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3003	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3004	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3005	2113945A09	CAP CER CHP 1000PF 50V 10%
C3010	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3011	2113946A01	CAP CER CHP 0.015UF 16V 10%
C3014	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3015	2115153H57	CAP, CERAMIC, COG
C3016	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3017	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3018	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3019	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3024	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3025	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3026	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3028	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3031	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3034	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3035	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3036	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3037	2113944A40	CAP CER CHP 100.0PF 50V 5%
C3038	2113944A40	CAP CER CHP 100.0PF 50V 5%
C3039	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C3045	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C3047	2113945C25	CAP,FXD,.033UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C3048	2113945C25	CAP,FXD,.033UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C3049	2113945C25	CAP,FXD,.033UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C3050	2113945C25	CAP,FXD,.033UF,+10%,-10%,50V-DC,0603,X7R,-55DEG CMIN,125DEG CMA
C3051	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C3060	2113944A80	CAP,FXD,20PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C3061	2113944A80	CAP,FXD,20PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C3062	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3063	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3065	2113956A51	CAP,FXD,1UF,+10%,-10%,6.3V-DC,0402,X5R,-55DEG CMIN,85DEG CMAX,P
C3067	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3070	2113944A25	CAP CER CHP 10.0PF 50V +/- 0.5PF
C3074	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3079	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C3080	NOTPLACED	
C3081	NOTPLACED	

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C3083	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3084	2113946K03	CAP,FXD,.22UF,+80%,-20%,16V-DC,0402,Y5V,-30DEG CMIN,85DEG CMAX
C3085	2113945A12	CAP CER CHP 3300PF 50V 10%
C3087	2113944A38	CAP CER CHP 82.0PF 50V 5%
C3088	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C3090	2113955D37	CAP,FXD,10UF,+10%,-10%,16V-DC,1206,X7R,-55DEG CMIN,125DEG CMAX
C3091	2113955D37	CAP,FXD,10UF,+10%,-10%,16V-DC,1206,X7R,-55DEG CMIN,125DEG CMAX
C3093	2113946N03	CAP CER CHP 2.2UF 16V
C3094	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3095	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3097	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3098	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3099	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3100	2113944A31	CAP CER CHP 33.0PF 50V 5%
C3101	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3102	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3200	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3201	2113955D37	CAP,FXD,10UF,+10%,-10%,16V-DC,1206,X7R,-55DEG CMIN,125DEG CMAX
C3202	2371572L02	POSCAP 68UF 6TPB68M
C3203	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3204	2115153H40	CAP, CERAMIC, COG
C3205	2113944A50	CAP CER CHP 680.0 PF 50V 5%
C3206	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C3207	2113955D37	CAP,FXD,10UF,+10%,-10%,16V-DC,1206,X7R,-55DEG CMIN,125DEG CMAX
C3208	2113946K03	CAP,FXD,.22UF,+80%,-20%,16V-DC,0402,Y5V,-30DEG CMIN,85DEG CMAX
C3209	2316410H01	POSCAP 22UF 8TPC22M
C3210	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3211	2115153H40	CAP, CERAMIC, COG
C3212	2113944A44	CAP CER CHP 220.0 PF 50V 5%
C3213	2113944A44	CAP CER CHP 220.0 PF 50V 5%
C3500	2113946F03	CAP CER CHP 4.7UF 6.3V 10%
C3700	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3701	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3702	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3703	2113946D02	CAP CER CHP 1.0UF 6.3V 10%
C3704	2113944A30	CAP CER CHP 27.0PF 50V 5%
C3705	2113945B02	CAP CER CHP 10,000PF 25V 10%
C3706	2113945A05	CAP CER CHP 470PF 50V 10%
C3707	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C3800	2113945D04	CAP CER CHP 100,000PF 25V 10%
C3805	2113946K03	CAP,FXD,.22UF,+80%,-20%,16V-DC,0402,Y5V,-30DEG CMIN,85DEG CMAX
C3999	2113945B02	CAP CER CHP 10,000PF 25V 10%
C7320	2175662M06	CAPACITOR, CERAMIC, 2% 100/50V
C7400	2115153H40	CAP, CERAMIC, COG
C8000	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C8001	2113944A28	CAP CER CHP 18.0PF 50V 5%
C8002	2113944A52	CAP CER CHP 1000.0 PF 50V 5%
C8003	2113946F05	CAP,CHIP,10UF,+10%,-10%,6.3V-DC,0805,X5R,-55DEG CMIN,85DEG CMAX
C8004	2113944A28	CAP CER CHP 18.0PF 50V 5%
C8013	2113944A84	CAP,FXD,43PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C8014	2113944A62	CAP,FXD,.75PF,.25PF+/-,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX
C8015	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C8016	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C8017	2113944A28	CAP CER CHP 18.0PF 50V 5%
C8018	2113944A09	CAP CER CHP 2.2PF 50V +/- 0.25PF
C8019	NOTPLACED	
C8020	2113944A52	CAP CER CHP 1000.0 PF 50V 5%
C8021	2113945Y02	CAP,FXD,.1UF,+10%,-10%,16V-DC,0402,X7R,-55DEG CMIN,125DEG CMAX
C8022	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C8023	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8029	2113944A52	CAP CER CHP 1000.0 PF 50V 5%
C8030	2113944A28	CAP CER CHP 18.0PF 50V 5%
C8031	2113946D05	CAP,CHIP,2.2UF,+10%,-10%,6.3V-DC,0603,X5R,-55DEG CMIN,85DEG CMA
C8032	2113945B02	CAP CER CHP 10,000PF 25V 10%
C8033	2113944A28	CAP CER CHP 18.0PF 50V 5%
C8034	2113944A28	CAP CER CHP 18.0PF 50V 5%
C8035	2113944A31	CAP CER CHP 33.0PF 50V 5%
C8036	2113944A52	CAP CER CHP 1000.0 PF 50V 5%
C9000	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9001	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9002	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9003	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9004	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9005	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB

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C9006	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9007	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9008	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9009	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9010	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9011	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9012	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9013	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9014	2113944C85	CAP,FXD,51PF,+5%,-5%,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C9015	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9016	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9017	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9018	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9019	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9020	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9021	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9022	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9023	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9024	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9025	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9026	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9027	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9028	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9029	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9030	2113944A17	CAP CER CHP 4.7PF 50V +/-0.25PF
C9031	2113944A17	CAP CER CHP 4.7PF 50V +/-0.25PF
C9032	2113944A17	CAP CER CHP 4.7PF 50V +/-0.25PF
C9033	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9034	NOTPLACED	
C9035	NOTPLACED	
C9038	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9039	2113944C85	CAP,FXD,51PF,+5%,-5%,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C9040	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9041	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9042	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9043	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9044	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9045	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9046	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9047	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9048	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9049	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9050	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9051	NOTPLACED	
C9053	NOTPLACED	
C9055	2113944A44	CAP CER CHP 220.0 PF 50V 5%
C9057	NOTPLACED	
C9058	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9059	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9060	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB

Circuit Ref	Motorola Part No.	Description
C9061	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9062	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9063	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9064	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9065	2113944C85	CAP,FXD,51PF,+5%,-5%,50V-DC,0603,C0G,-55DEG CMIN,125DEG CMAX,PB
C9066	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9067	NOTPLACED	
C9068	NOTPLACED	
C9069	NOTPLACED	
C9071	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9072	2113944A85	CAP,FXD,51PF,+5%,-5%,50V-DC,0402,C0G,-55DEG CMIN,125DEG CMAX,PB
C9074	2313960A55	CAP,FXD,.47UF,+10%,-10%,25V-DC,SM,-55DEG CMIN,125DEG CMAX,73MA
C9075	2313960C26	CAP,FXD,1UF,+10%,-10%,35V-DC,SM,-55DEG CMIN,125DEG CMAX,114MA,E
D002	4871852M02	SWITCHING DIODE, UMN10
D003	4871852M01	SCHOTTKY BARRIER DIODE
D200	4805656W87	DIODE,VCTR, @ 15V,1SV279,,SOD-523/SC-79
D201	4805656W87	DIODE,VCTR, @ 15V,1SV279,,SOD-523/SC-79
D202	4884800Y03	SILICON EPITAXIAL PIN TYPE DIODE
D204	4805656W87	DIODE,VCTR, @ 15V,1SV279,,SOD-523/SC-79
D205	4805656W87	DIODE,VCTR, @ 15V,1SV279,,SOD-523/SC-79
D400	4813974A19	DIODE ARRAY,MXR,SM,SOT-323,7V,.2W,SHTK,2,PB-FREE
D600	4815096H01	VARACTOR DIODE 1SV305
D601	4815096H01	VARACTOR DIODE 1SV305
D3000	4813978A25	SCHOTTKY 30V SOD-323 T&R PB FREE
D9000	4805729G49	DIODE RED/YEL
E001	2480640Z01	SURFACE MOUNT FERRITE BEAD
E002	2480640Z01	SURFACE MOUNT FERRITE BEAD
E003	2480640Z01	SURFACE MOUNT FERRITE BEAD
E004	2480640Z01	SURFACE MOUNT FERRITE BEAD
E006	2480640Z01	SURFACE MOUNT FERRITE BEAD
E007	2480640Z01	SURFACE MOUNT FERRITE BEAD
E401	7685345Y01	FILTER,FERRITE BEAD,50MA,SM,0402
E600	2480640Z01	SURFACE MOUNT FERRITE BEAD
E601	2480640Z01	SURFACE MOUNT FERRITE BEAD
E602	2480640Z01	SURFACE MOUNT FERRITE BEAD
E701	7688697V17	EMI FILTER,FERR,2A,SM,0603,PB-FREE
E1062	2480640Z01	SURFACE MOUNT FERRITE BEAD
E3030	2409134J04	IND CHIP FER FLTR 600 0603 (000)
E3031	2409134J04	IND CHIP FER FLTR 600 0603 (000)
E3032	2409134J04	IND CHIP FER FLTR 600 0603 (000)
E3033	2409134J04	IND CHIP FER FLTR 600 0603 (000)
E3700	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E3701	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E3702	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E3703	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E3704	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E3705	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E8000	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E8001	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E8003	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E8004	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E8005	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E8006	7686949J08	FLTR,FERR,,,,1A,,,,,SM,0603
E9000	7688697V17	EMI FILTER,FERR,2A,SM,0603,PB-FREE
E9001	2480640Z01	SURFACE MOUNT FERRITE BEAD
E9006	NOTPLACED	
E9007	NOTPLACED	
F9000	6515076H01	FUSE CHIP SMT TR/1608FF 3A
FL400	9116854H02	73.35 MHZ 4 POLE CRYSTAL FILTER
FL401	9105849W18	FLTR, SAW, ISM BAND
FL402	9105849W18	FLTR, SAW, ISM BAND
FL8000	9180310L38	PASSIVE FILTER,SAW,BANDPASS,1.5 7542
FL8001	9180310L38	PASSIVE FILTER,SAW,BANDPASS,1.5 7542
FL9000	2515003H02	CHIP COMMON MODE CHOKE COILS
J1	0915064H02	ZIF (20 PINS)
J9001	0970312L02	40 PIN BOARD-TO-BOARD CONNECTOR
L001	2478390A22	0402 CHIP INDUCTOR
L200	2478057A28	CHIP INDUCTOR - 0603HP SERIES-150NH
L201	2478390A10	0402 CHIP INDUCTOR
L202	4805911Z02	RESONATOR CERAMIC
L203	2478057A47	0306 HIGH Q CHIP INDUCTOR
L204	2478057A47	0306 HIGH Q CHIP INDUCTOR
L205	2478057A28	CHIP INDUCTOR - 0603HP SERIES-150NH
L206	2478057A28	CHIP INDUCTOR - 0603HP SERIES-150NH
L207	2478390A11	0402 CHIP INDUCTOR
L208	4805911Z02	RESONATOR CERAMIC
L209	2478057A47	0306 HIGH Q CHIP INDUCTOR
L210	2478057A47	0306 HIGH Q CHIP INDUCTOR
L211	2478057A28	CHIP INDUCTOR - 0603HP SERIES-150NH
L213	2414017P17	IDCTR,CHIP,22NH,5%,300MA,.88OHM,CER,9 Q,1.8GHZ SRF,SM,0402,P
L215	2488090Y12	INDUCTOR,MULTILAYER,8.2NH,1005,SMD,PB FREE
L216	2414017N17	IDCTR,CHIP,27NH,5%,600MA,.62OHM,CER,12 Q,1.2GHZ SRF,SM,0603
L217	2488090Y15	INDUCTOR,MULTILAYER,15NH,1005,SMD,PB FREE
L218	2488090Y12	INDUCTOR,MULTILAYER,8.2NH,1005,SMD,PB FREE
L401	2415427H19	CHIP INDUCTOR
L403	2416540H11	CHIP INDUCTOR
L405	2416540H28	CHIP INDUCTOR
L406	2415429H02	CHIP INDUCTOR
L407	2416540H21	CHIP INDUCTOR
L410	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
L411	2415429H35	CHIP INDUCTOR
L412	2478057A52	0306 HIGH Q CHIP INDUCTOR
L414	2415429H03	CHIP INDUCTOR
L415	2415429H46	CHIP INDUCTOR
L416	2414017N27	IDCTR,CHIP,180NH,5%,150MA,2.7OHM,CER,11 Q,500MHZ SRF,SM,0603
L417	2415718H37	CHIP INDUCTOR
L418	2415429H45	CHIP INDUCTOR

Circuit Ref	Motorola Part No.	Description
L600	2466505A01	COIL INDUCTOR
L601	2466505A01	COIL INDUCTOR
L602	2415569H01	INDUCTOR 4.7UH
L603	2415718H37	CHIP INDUCTOR
L604	2414015B26	IDCTR,FXD,330NH,2%,310MA,1.4OHM,CER,48 Q,600MHZ SRF,SM,0805
L605	2415569H01	INDUCTOR 4.7UH
L700	2414017N25	IDCTR,CHIP,120NH,5%,200MA,2.4OHM,CER,12 Q,600MHZ SRF,SM,0603
L701	2414017N25	IDCTR,CHIP,120NH,5%,200MA,2.4OHM,CER,12 Q,600MHZ SRF,SM,0603
L702	2415429H02	CHIP INDUCTOR
L703	2416307H03	IDCTR,WW,270NH,5%,0603
L704	2415429H02	CHIP INDUCTOR
L706	2471884M03	12.3 NH SQUARE SPRING
L900	2471911M01	SQUARE AIR CORE INDUCTORS
L901	2471884M02	6.0 NH SQUARE SPRING
L903	2471911M01	SQUARE AIR CORE INDUCTORS
L905	2415429H04	CHIP INDUCTOR
L906	2415429H07	CHIP INDUCTOR
L907	2478057A23	18 NH SURFACE MOUNT INDUCTOR
L908	2478057A23	18 NH SURFACE MOUNT INDUCTOR
L3003	2464675H01	IDCTR,WW,560NH,5%,550MA
L3004	2464675H01	IDCTR,WW,560NH,5%,550MA
L3020	2489846Y06	IDCTR,WW,10UH,20,490MA,.0.67OHM,FERR,,,,,,SM,,,PWR, 3X2.8X1.0MM
L3021	2489846Y06	IDCTR,WW,10UH,20,490MA,.0.67OHM,FERR,,,,,,SM,,,PWR, 3X2.8X1.0MM
L3022	2464675H01	IDCTR,WW,560NH,5%,550MA
L8001	2414017P10	IDCTR,CHIP,5.6NH,300MA,.29OHM,CER,9 Q,3.28GHZ SRF,SM,0402,P
L8002	2414017P17	IDCTR,CHIP,22NH,5%,300MA,.88OHM,CER,9 Q,1.8GHZ SRF,SM,0402,P
L8003	2414017P13	IDCTR,CHIP,10NH,5%,300MA,.46OHM,CER,9 Q,2.5GHZ SRF,SM,0402,P
L8004	2414017P10	IDCTR,CHIP,5.6NH,300MA,.29OHM,CER,9 Q,3.28GHZ SRF,SM,0402,P
L9000	2471698M01	TAIYO YUDEN CHIP INDUCTOR 0603 SIZE
L9001	2415429H45	CHIP INDUCTOR
L9007	2415429H45	CHIP INDUCTOR
L9008	2415429H45	CHIP INDUCTOR
M9000	43012014001	SPACER, TUBULAR
M9001	4371105L01	BOARD SPACER
M9002	43012014001	SPACER, TUBULAR
M9003	NOTPLACED	
M9004	NOTPLACED	
M9005	3915478H01	SPEAKER CONTACT PAD
M9006	3915478H01	SPEAKER CONTACT PAD
M9007	0915184H01	CONNECTOR, BATTERY CONTACT
M9008	43012003001	PHOENIX SPACER TUBULAR
P900	2815696H01	SMA ANTENNA NUT CUM RF CONTACTS
P9000	2887818K02	PLUG 0.5 PITCH 16 CKT
Q001	4816134H02	100MA/-50V DIGITAL TRANSISTOR
Q200	4815272H01	DBRT EMD9FT2R
Q201	4815272H01	DBRT EMD9FT2R
Q202	4809939C31	TSTR DUAL NPN/PNP EMD3T
Q203	4815029H01	NPN SILICON TRANSISTOR
Q204	4815029H01	NPN SILICON TRANSISTOR
Q205	4889481V02	XSTR,BIP RF SML SGNL,NPN,NE685,SM,6V,.14W,30MA,PB-FREE
Q206	4809939C31	TSTR DUAL NPN/PNP EMD3T
Q400	4802197J95	RF TRANSISTOR PBR941
Q401	4802197J95	RF TRANSISTOR PBR941
Q600	4813973A04	XSTR,BIP GP SS,NPN,TA13,SM,SOT-23,SMT,30V,.225W,300MA,125MHZ,P
Q601	4815055H01	TSTR DUAL NPN/PNP UMH5
Q602	4885061Y01	XSTR NPN 6V 30UA 12GHZ PB-FREE
Q701	4815055H01	TSTR DUAL NPN/PNP UMH5
Q702	4815055H01	TSTR DUAL NPN/PNP UMH5
Q703	4816547H01	PRE DRIVER EPP PART
Q704	4816698H01	MOD,XSTR,FET RF PWR,7/800
Q900	4809807C55	XSTR FET GEN PURPOSE SMAL SIG N-CH DUAL NFET, W18 COMPLIANT
Q901	4809807C55	XSTR FET GEN PURPOSE SMAL SIG N-CH DUAL NFET, W18 COMPLIANT
Q3000	4805585Q23	XSTR,FET GEN PURP,PB-FREE
Q3001	4805585Q23	XSTR,FET GEN PURP,PB-FREE
Q3002	4816134H01	DIGITAL TRANSISTORS
Q3003	4813970A62	XSTR,FET GP PWR,MOSFET,P-CH,ENHN,CF,-20V,1.3W,PB-FREE
Q3005	4805585Q23	XSTR,FET GEN PURP,PB-FREE
Q3006	4816134H01	DIGITAL TRANSISTORS
Q3010	4805585Q23	XSTR,FET GEN PURP,PB-FREE
Q9000	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA,300MHZ
Q9001	4815154H01	DUAL TRANS NPN
Q9003	4813973M07	XSTR,BIP GP SS,NPN,T3904,SM,SOT-23,SMT,40V,.225W,200MA,300MHZ
R001	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R002	0613952Q93	CER CHIP RES 6800 OHM 5 0402
R003	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R004	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R005	0613952K01	CER CHIP RES 10.0 OHM 1% 0402
R006	0613952Q49	CER CHIP RES 100 OHM 5 0402
R007	0613952Q56	CER CHIP RES 200 OHM 5 0402
R008	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R009	0613952Q49	CER CHIP RES 100 OHM 5 0402
R011	0613952Q82	CER CHIP RES 2400 OHM 5 0402
R012	0613952Q57	CER CHIP RES 220 OHM 5 0402
R018	0613952G67	CER CHIP RES 0.0 +/-0.050 OHM
R019	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R200	0613952Q83	CER CHIP RES 2700 OHM 5 0402
R201	0613952Q85	CER CHIP RES 3300 OHM 5 0402
R202	0613952Q49	CER CHIP RES 100 OHM 5 0402
R203	0613952Q49	CER CHIP RES 100 OHM 5 0402
R208	0613952Q82	CER CHIP RES 2400 OHM 5 0402
R209	0613952Q84	CER CHIP RES 3000 OHM 5 0402
R210	0613952Q49	CER CHIP RES 100 OHM 5 0402
R211	0613952Q51	CER CHIP RES 120 OHM 5 0402
R212	0613952Q58	CER CHIP RES 240 OHM 5 0402
R213	0613952M69	CER CHIP RES 5110 OHM 1 0402
R214	0613952Q32	CER CHIP RES 20.0 OHM 5 0402

Circuit Ref	Motorola Part No.	Description
R215	0613952Q91	CER CHIP RES 5600 OHM 5 0402
R216	0613952L30	CER CHIP RES 200 OHM 1 0402
R217	0613952Q59	CER CHIP RES 270 OHM 5 0402
R218	0613952Q32	CER CHIP RES 20.0 OHM 5 0402
R219	0613952Q32	CER CHIP RES 20.0 OHM 5 0402
R220	0613952Q59	CER CHIP RES 270 OHM 5 0402
R221	0613952Q32	CER CHIP RES 20.0 OHM 5 0402
R222	0613952Q59	CER CHIP RES 270 OHM 5 0402
R223	0613952Q68	CER CHIP RES 620 OHM 5 0402
R224	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R402	0613952Q65	CER CHIP RES 470 OHM 5 0402
R403	0613952Q72	CER CHIP RES 910 OHM 5 0402
R406	0613952Q67	CER CHIP RES 560 OHM 5 0402
R407	0613952Q67	CER CHIP RES 560 OHM 5 0402
R408	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R409	0613952R08	CER CHIP RES 20K OHM 5 0402
R410	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R411	0613952R19	CER CHIP RES 56K OHM 5% 0402
R412	0613952Q61	CER CHIP RES 330 OHM 5 0402
R413	0613952Q75	CER CHIP RES 1200 OHM 5 0402
R417	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R419	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R420	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R421	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R422	0613952R12	CER CHIP RES 30K OHM 5 0402
R424	0613952R12	CER CHIP RES 30K OHM 5 0402
R425	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R496	0613952Q69	CER CHIP RES 680 OHM 5 0402
R497	NOTPLACED	
R600	0613952R01	CER CHIP RES 10K OHM 5% 0402
R601	0613952Q55	CER CHIP RES 180 OHM 5 0402
R602	0613952Q61	CER CHIP RES 330 OHM 5 0402
R603	0613952R05	CER CHIP RES 15K OHM 5% 0402
R604	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R605	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R606	0613952Q75	CER CHIP RES 1200 OHM 5 0402
R607	0613952R25	CER CHIP RES 100K OHM 5% 0402
R609	0613952R01	CER CHIP RES 10K OHM 5% 0402
R610	0613952R01	CER CHIP RES 10K OHM 5% 0402
R611	0613952Q63	CER CHIP RES 390 OHM 5 0402
R612	0613952R08	CER CHIP RES 20K OHM 5 0402
R697	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R698	0613952R01	CER CHIP RES 10K OHM 5% 0402
R699	0613952R25	CER CHIP RES 100K OHM 5% 0402
R700	0615043C01	RES POWER METAL STRIP W18 COMPLIANT
R701	NOTPLACED	
R702	0613952Z80	RES,MF,330KOHM,1%,.0625 W,SM,0402,200PPM/ CEL,PB-FREE
R703	0613952Z80	RES,MF,330KOHM,1%,.0625 W,SM,0402,200PPM/ CEL,PB-FREE
R704	NOTPLACED	
R705	0675679M01	KAMAYA 2MOHM -/+1% -55 +155 DEG. C
R706	0675679M01	KAMAYA 2MOHM -/+1% -55 +155 DEG. C
R707	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R708	0613952Q90	CER CHIP RES 5100 OHM 5 0402
R709	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R710	NOTPLACED	
R711	0613952R08	CER CHIP RES 20K OHM 5 0402
R712	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R713	NOTPLACED	
R714	0613952Q59	CER CHIP RES 270 OHM 5 0402
R717	0613958H33	CER CHIP RES 22.0 OHM 5% 0805
R718	0613952Q56	CER CHIP RES 200 OHM 5 0402
R719	0613952Q42	CER CHIP RES 51.0 OHM 5 0402
R720	NOTPLACED	
R723	0613952Q48	CER CHIP RES 91.0 OHM 5 0402
R725	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R726	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R727	NOTPLACED	
R728	0613952Q60	CER CHIP RES 300 OHM 5 0402
R729	0613952Q33	CER CHIP RES 22.0 OHM 5 0402
R730	0613952Q60	CER CHIP RES 300 OHM 5 0402
R731	NOTPLACED	6
R732	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R733	0613952R17	CER CHIP RES 47K OHM 5% 0402
R902	0613952R01	CER CHIP RES 10K OHM 5% 0402
R903	0613952R01	CER CHIP RES 10K OHM 5% 0402
R904	0613952R01	CER CHIP RES 10K OHM 5% 0402
R905	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1000	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R1001	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1005	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1006	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1013	NOTPLACED	
R1014	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1017	NOTPLACED	
R1019	0613952Q18	CER CHIP RES 5.1 OHM 5 0402
R1020	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1021	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1023	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1025	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1026	0613952R17	CER CHIP RES 47K OHM 5% 0402
R1027	NOTPLACED	
R1028	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1034	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1035	NOTPLACED	
R1036	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1041	0613952Q73	CER CHIP RES 1000 OHM 5 0402

Circuit Ref	Motorola Part No.	Description
R1045	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1046	NOTPLACED	
R1048	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1053	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1054	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R1055	NOTPLACED	
R1060	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R1061	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1063	NOTPLACED	
R1065	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1067	0613952R03	CER CHIP RES 12K OHM 5% 0402
R1068	0613952R10	CER CHIP RES 24K OHM 5 0402
R1069	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1070	0613952R01	CER CHIP RES 10K OHM 5% 0402
R1072	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R1100	NOTPLACED	
R2000	0613952R01	CER CHIP RES 10K OHM 5% 0402
R2002	NOTPLACED	
R2003	NOTPLACED	
R2004	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R2005	NOTPLACED	
R2006	NOTPLACED	
R2007	NOTPLACED	
R2008	NOTPLACED	
R2009	NOTPLACED	
R2010	0613952R01	CER CHIP RES 10K OHM 5% 0402
R2011	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R2012	0613952R01	CER CHIP RES 10K OHM 5% 0402
R2013	NOTPLACED	
R2014	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R2015	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R3004	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3005	NOTPLACED	
R3006	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3007	NOTPLACED	
R3008	0613952Z55	RES,MF,12KOHM,1%,.0625 W,SM,0402,200PPM/ CEL,PB-FREE
R3009	0613952Z48	RES,MF,4.7KOHM,1%,.0625 W,SM,0402,200PPM/ CEL,PB-FREE
R3010	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3011	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R3012	0613952Q59	CER CHIP RES 270 OHM 5 0402
R3013	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R3014	0613952M30	CER CHIP RES 2000 OHM 1 0402
R3017	0613952P25	CER CHIP RES 178K OHM 1 0402
R3018	0613952R18	CER CHIP RES 51K OHM 5 0402
R3020	0613952Q34	CER CHIP RES 24.0 OHM 5 0402
R3021	0613952Q34	CER CHIP RES 24.0 OHM 5 0402
R3023	0613952R17	CER CHIP RES 47K OHM 5% 0402
R3025	0613952Q49	CER CHIP RES 100 OHM 5 0402
R3026	0613952Q59	CER CHIP RES 270 OHM 5 0402
R3027	0613952Q59	CER CHIP RES 270 OHM 5 0402
R3028	0613952N69	CER CHIP RES 51.1K OHM 1 0402
R3029	0613952N60	CER CHIP RES 41.2K OHM 1 0402
R3030	0686135Z02	KAMAYA 0.2 OHM RLC16-R200FTP
R3031	0613952Z67	RES,MF,51KOHM,1%,.0625 W,SM,0402,200
R3032	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R3033	0613952R05	CER CHIP RES 15K OHM 5% 0402
R3034	0613952Q95	CER CHIP RES 8200 OHM 5 0402
R3035	0613952R05	CER CHIP RES 15K OHM 5% 0402
R3036	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3037	0613952Q77	CER CHIP RES 1500 OHM 5 0402
R3050	0613952R25	CER CHIP RES 100K OHM 5% 0402
R3053	0613952Z58	RES,MF,22KOHM,1%,.0625 W,SM,0402,200PPM/ CEL,PB-FREE
R3054	0613952Z58	RES,MF,22KOHM,1%,.0625 W,SM,0402,200PPM/ CEL,PB-FREE
R3055	0613952R25	CER CHIP RES 100K OHM 5% 0402
R3056	NOTPLACED	
R3060	0613952M30	CER CHIP RES 2000 OHM 1 0402
R3061	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3070	0613952R33	CER CHIP RES 220K OHM 5% 0402
R3071	0613952R33	CER CHIP RES 220K OHM 5% 0402
R3072	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R3073	0613952R56	CER CHIP RES 2.0M OHM 5 0402
R3074	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R3075	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3098	0613952Q85	CER CHIP RES 3300 OHM 5 0402
R3100	0613952R17	CER CHIP RES 47K OHM 5% 0402
R3101	0613952R25	CER CHIP RES 100K OHM 5% 0402
R3102	0613952A30	CER CHIP RES 2.00 OHM 1% 0603
R3103	0615049H16	KAMAYA RLC32 CURRENT SENSE RESISTOR
R3200	0613952R33	CER CHIP RES 220K OHM 5% 0402
R3201	0613952R20	CER CHIP RES 62K OHM 5 0402
R3202	0613952R33	CER CHIP RES 220K OHM 5% 0402
R3203	0613952R36	CER CHIP RES 300K OHM 5 0402
R3300	0613952N01	CER CHIP RES 10.0K OHM 1 0402
R3301	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R3304	0613952Q81	CER CHIP RES 2200 OHM 5 0402
R3305	0613952R32	CER CHIP RES 200K OHM 5 0402
R3500	0613952Q77	CER CHIP RES 1500 OHM 5 0402
R3501	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R3700	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R3701	0613952R01	CER CHIP RES 10K OHM 5% 0402
R3702	0613952N48	CER CHIP RES 30.9K OHM 1 0402
R3703	0613952N38	CER CHIP RES 24.3K OHM 1 0402
R3704	0613952R01	CER CHIP RES 10K OHM 5% 0402
R3800	0613952Q25	CER CHIP RES 10.0 OHM 5 0402
R8002	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8003	0613952R01	CER CHIP RES 10K OHM 5% 0402
R8004	0613952Q70	CER CHIP RES 750 OHM 5 0402

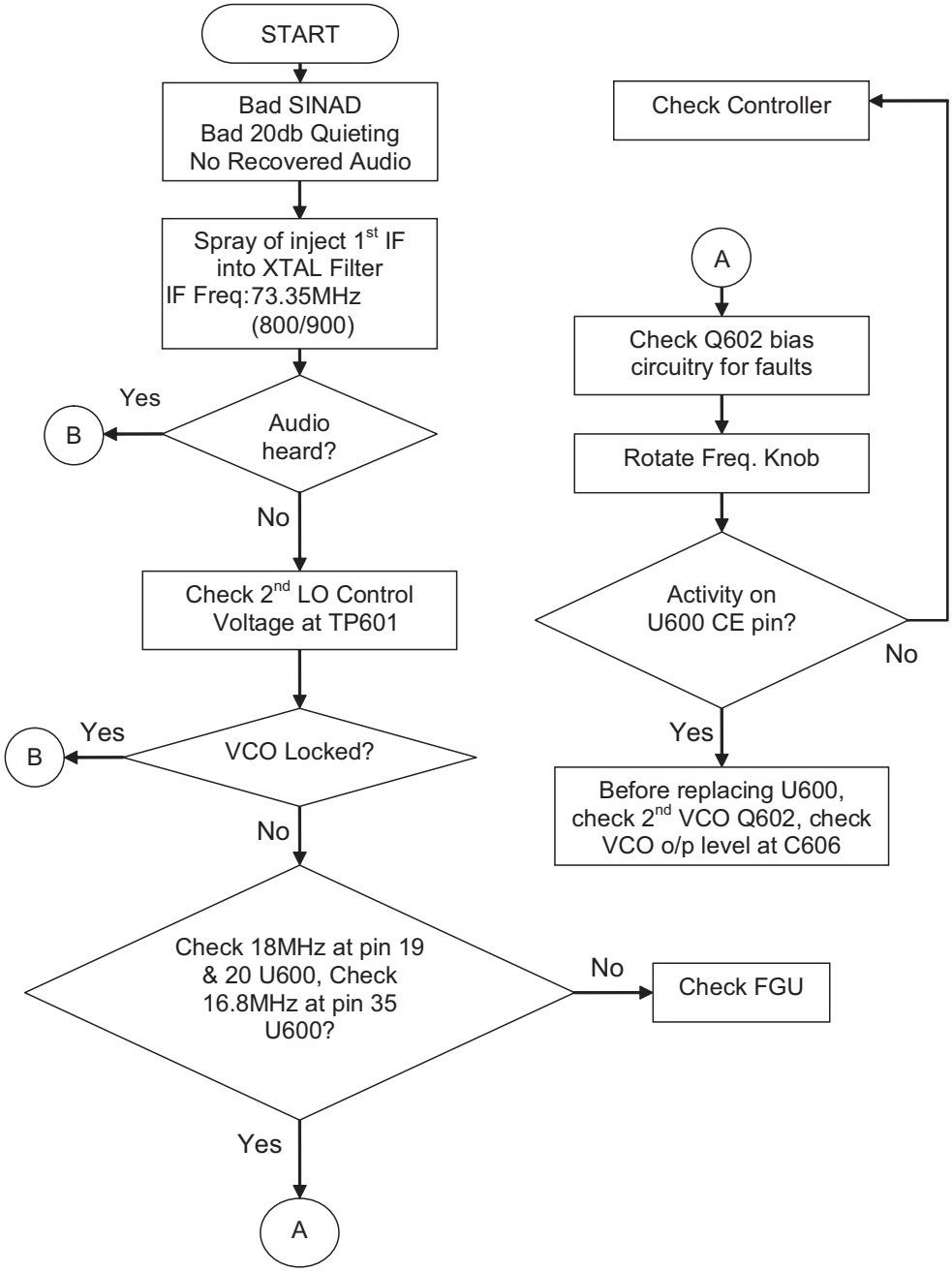
Circuit Ref	Motorola Part No.	Description
R8010	0613952R05	CER CHIP RES 15K OHM 5% 0402
R8011	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8012	0613952R01	CER CHIP RES 10K OHM 5% 0402
R8020	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8023	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8024	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8025	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R8026	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8027	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8028	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8029	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8030	0613952R01	CER CHIP RES 10K OHM 5% 0402
R8031	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8032	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8033	0613952R25	CER CHIP RES 100K OHM 5% 0402
R8034	0613952R01	CER CHIP RES 10K OHM 5% 0402
R8035	0613952R01	CER CHIP RES 10K OHM 5% 0402
R8036	0613952R01	CER CHIP RES 10K OHM 5% 0402
R8037	0613952R01	CER CHIP RES 10K OHM 5% 0402
R8038	NOTPLACED	
R8039	NOTPLACED	
R9000	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9001	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9002	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9003	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9004	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9005	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9006	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9007	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9008	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9009	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9010	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9011	0613952R17	CER CHIP RES 47K OHM 5% 0402
R9012	0613952Q50	CER CHIP RES 110 OHM 5 0402
R9013	0613952Q37	CER CHIP RES 33.0 OHM 5 0402
R9014	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9015	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9016	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9017	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9018	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9019	0613952Q73	CER CHIP RES 1000 OHM 5 0402
R9020	0613952Q89	CER CHIP RES 4700 OHM 5 0402
R9022	0613952R66	CER CHIP RES 0.0 +/-0.050 OHM
R9050	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9051	0613952R01	CER CHIP RES 10K OHM 5% 0402
R9052	0613952Q65	CER CHIP RES 470 OHM 5 0402
S9000	4086470Z01	TACT SWITCH
S9001	4015186H02	SWITCH, VOLUME
S9002	4015203H05	SWITCH, FREQUENCY
SH001	2678225A02	SHIELD
SH002	2678226A01	SHIELD
SH003	2678227A01	SHIELD
SH004	2678228A01	SHIELD
SH005	2678229A01	SHIELD
SH006	2678230A01	SHIELD
SH007	2678231A01	SHIELD
SH008	2678232A02	SHIELD
SH009	NOTPLACED	
SH010	26012010001	BOTTOM VCO SHIELD
U001	5164015H28	IC,TRIDENT,INTEG SYNTH,RX/TX BSBND
U200	5116014H01	BUFFER IC
U201	5186310Y39	RF SWITCH,SPDT,SPDT,SMT,SC70, (ROHS - COMPLIANT)
U400	5115443H02	MAXIM EPP LNA LIFE MAX2373ETC+T
U401	5178267A01	SILICON DOUBLE BALANCED HMIC MIXER
U402	5186310Y39	RF SWITCH,SPDT,SPDT,SMT,SC70, (ROHS - COMPLIANT)
U403	5186310Y39	RF SWITCH,SPDT,SPDT,SMT,SC70, (ROHS - COMPLIANT)
U404	5186310Y39	RF SWITCH,SPDT,SPDT,SMT,SC70, (ROHS - COMPLIANT)
U405	5186310Y39	RF SWITCH,SPDT,SPDT,SMT,SC70, (ROHS - COMPLIANT)
U600	5102495J14	IC,IF,,IF DIGITILIZING SUBSYSTEM IC,AD9864,QFN
U700	4802246J29	XSTR,BIP RF POWER,,,ADA4743,,,,,,.37W
U701	5115147H01	OPERATIONAL AMPLIFIER, IC
U702	5115022H01	IC TEMPERATURE SENSOR
U900	5189567V08	IC,RF SWITCH,SPDT,SMT,10W,10V,PB-FREE
U901	5189567V08	IC,RF SWITCH,SPDT,SMT,10W,10V,PB-FREE
U1000	5102495J13	IC,MICROP,P1710ZZGE,BGA,,,12MHZ,32BITS
U1005	5171209L01	4-BIT BIDIRECTION LEVEL TRANSLATOR
U1006	5115001H02	NL27WZU04DFT2G INVERTER (EPP)
U2000	0104032J81	PRE-FLASHED FLASH IC
U2001	51012031001	32MB DIE SHRINK DDR SDRAM IC
U3000	5.19E+83	IC, MAKO ASIC, CMOS PWR MGMT
U3002	5115616H01	NS LP8340 1.0A LINEAR REGULATOR
U3003	5115453H01	RAIL TO RAIL OUTPUT, 8 PIN BGA
U3004	5114007A43	IC,INVTR,1PER PKG,SOT-353,VCC RANGE 1.65 TO 5.5V, PB-FREE
U3006	5175237H01	VOLT.REGULATOR,LINEAR, 150 MA, 1.2V.
U3007	5171395L01	TI DUAL ANALOG SWITCH TS5A23166
U3008	5115391H01	LINEAR REGULATOR IC
U3010	5164852H47	IC, I2C LEVEL TRANSLATOR
U3020	5171428L01	LINEAR TECH SYN BUCK DC CONVERTER
U3021	5171428L01	LINEAR TECH SYN BUCK DC CONVERTER
U3700	5116282H01	100MA LDO LINEAR REGULATOR
U3701	5116283H01	100MA LDO LINEAR REGULATOR
U8000	0104034J14	PRE-FLASHED SIRF SINGLE CHIP GPS IC
U8001	5164015H55	IC,RF AMPLIFIER,,UPC8211TK,SM,,,18.5DB,1.57GHZMIN,1.57GHZMAX
U8002	4815055H01	TSTR DUAL NPN/PNP UMH5
U8003	7688697V17	EMI FILTER,FERR,2A,SM,0603,PB-FREE

Circuit Ref	Motorola Part No.	Description
VR402	4888116D01	VSTR,150V,24V-DC,SM,PB FREE
VR900	4888116D01	VSTR,150V,24V-DC,SM,PB FREE
VR901	4888116D01	VSTR,150V,24V-DC,SM,PB FREE
VR902	4888116D01	VSTR,150V,24V-DC,SM,PB FREE
VR903	4888116D01	VSTR,150V,24V-DC,SM,PB FREE
VR904	4888116D01	VSTR,150V,24V-DC,SM,PB FREE
VR9000	4866544A01	DIODE ARRAY,ZEN,SR05.TCT,SM,,,5V,,,5,LOW CAPACITANCE TVS DIO
VR9001	4813979P10	DIODE ARRAY,TRNSNT PROT,SM,SOT-457,5.6V,.225W,ZEN,4,PB-FREE
VR9002	4813979P10	DIODE ARRAY,TRNSNT PROT,SM,SOT-457,5.6V,.225W,ZEN,4,PB-FREE
VR9003	4815040H01	ZENER DIODE-12V
VR9004	4815040H01	ZENER DIODE-12V
VR9005	4805656W76	DIODE,ZEN,,SM,SOD-523,,,,,,5.6V
VR9006	4805656W76	DIODE,ZEN,,SM,SOD-523,,,,,,5.6V
VR9007	4805656W76	DIODE,ZEN,,SM,SOD-523,,,,,,5.6V
VR9008	4813979P10	DIODE ARRAY,TRNSNT PROT,SM,SOT-457,5.6V,.225W,ZEN,4,PB-FREE
VR9009	4813977C23	DIODE,ZEN,MMSZ5243,SM,SOD-123,13V,10MA,.5W,ZEN,PB-FREE
VR9010	4813977C23	DIODE,ZEN,MMSZ5243,SM,SOD-123,13V,10MA,.5W,ZEN,PB-FREE
VR9015	NOTPLACED	
VR9016	NOTPLACED	
VR9017	4815040H01	ZENER DIODE-12V
VR9018	4815040H01	ZENER DIODE-12V
VR9020	4813979P10	DIODE ARRAY,TRNSNT PROT,SM,SOT-457,5.6V,.225W,ZEN,4,PB-FREE
VR9021	4813979P10	DIODE ARRAY,TRNSNT PROT,SM,SOT-457,5.6V,.225W,ZEN,4,PB-FREE
VR9022	4813979P10	DIODE ARRAY,TRNSNT PROT,SM,SOT-457,5.6V,.225W,ZEN,4,PB-FREE
VR9023	4815040H01	ZENER DIODE-12V
Y001	4875188M01	CRYSTAL OSCILLATOR
Y1000	93012000001	XTAL 12MHZ,10PPM,3.2X2.5X0.55 MM SMD
Y3000	4802582S80	RESON,QRTZ,.032768MHZ,20PPM TOL,,,SM,,PAR,,12.5PF LOAD CAP,-40DE
Y3001	4815028H01	CX-101F 24.57MHZ KSS XTAL
Y8000	4802582S80	RESON,QRTZ,.032768MHZ,20PPM TOL,,,SM,,PAR,,12.5PF LOAD CAP,-40DE

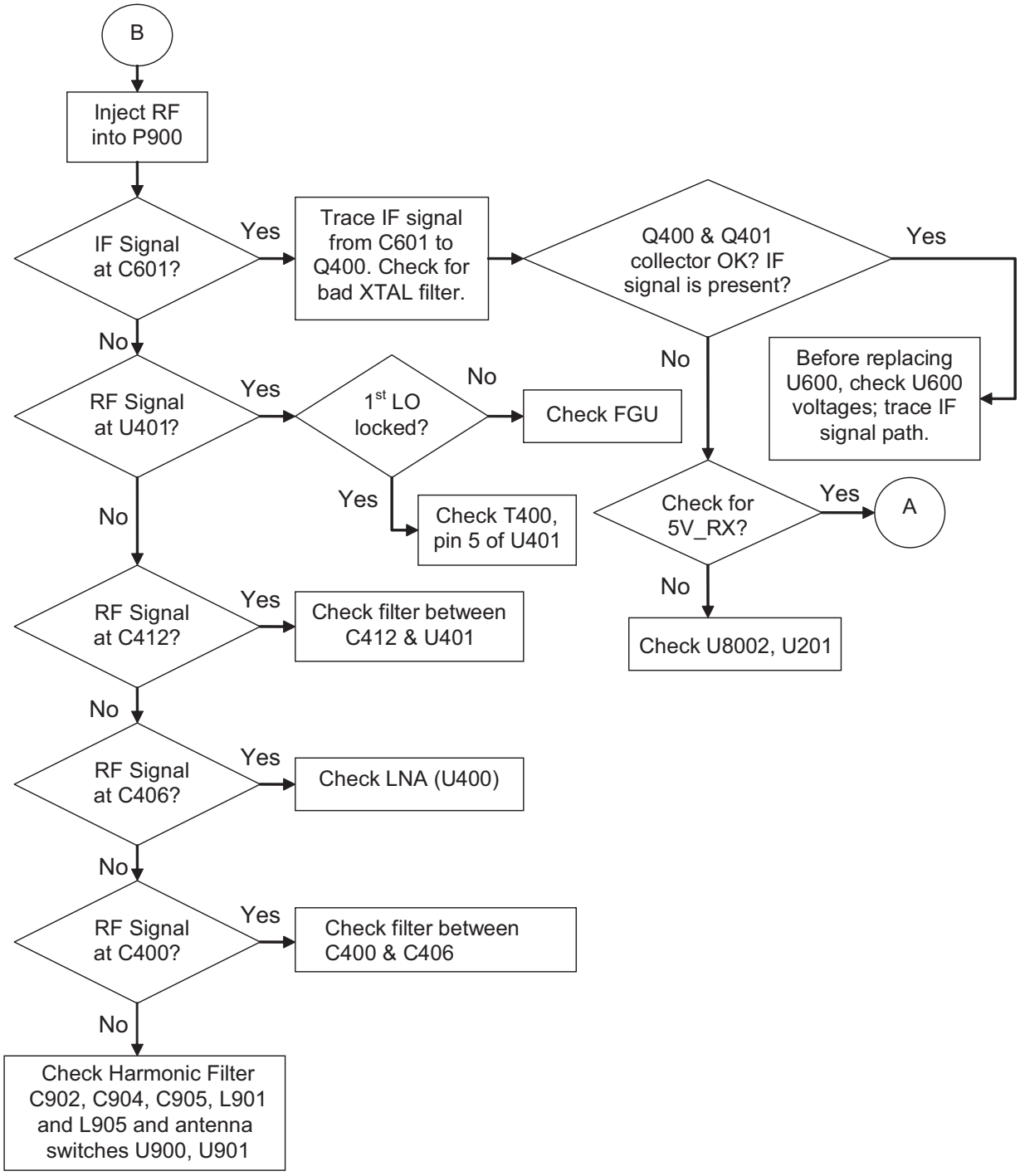
Section 7

TROUBLESHOOTING CHARTS

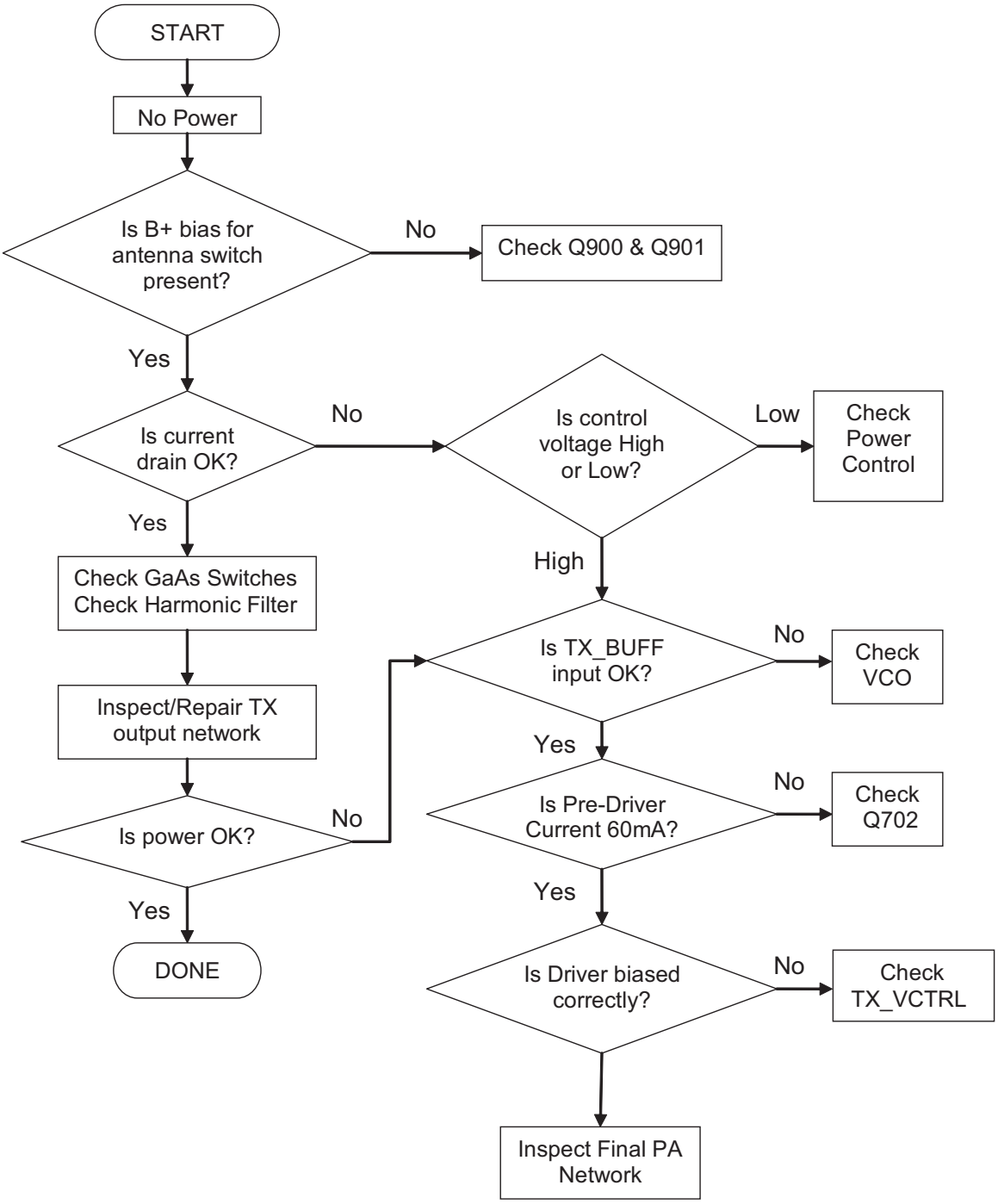
1.0 800/900 Band Troubleshooting Charts



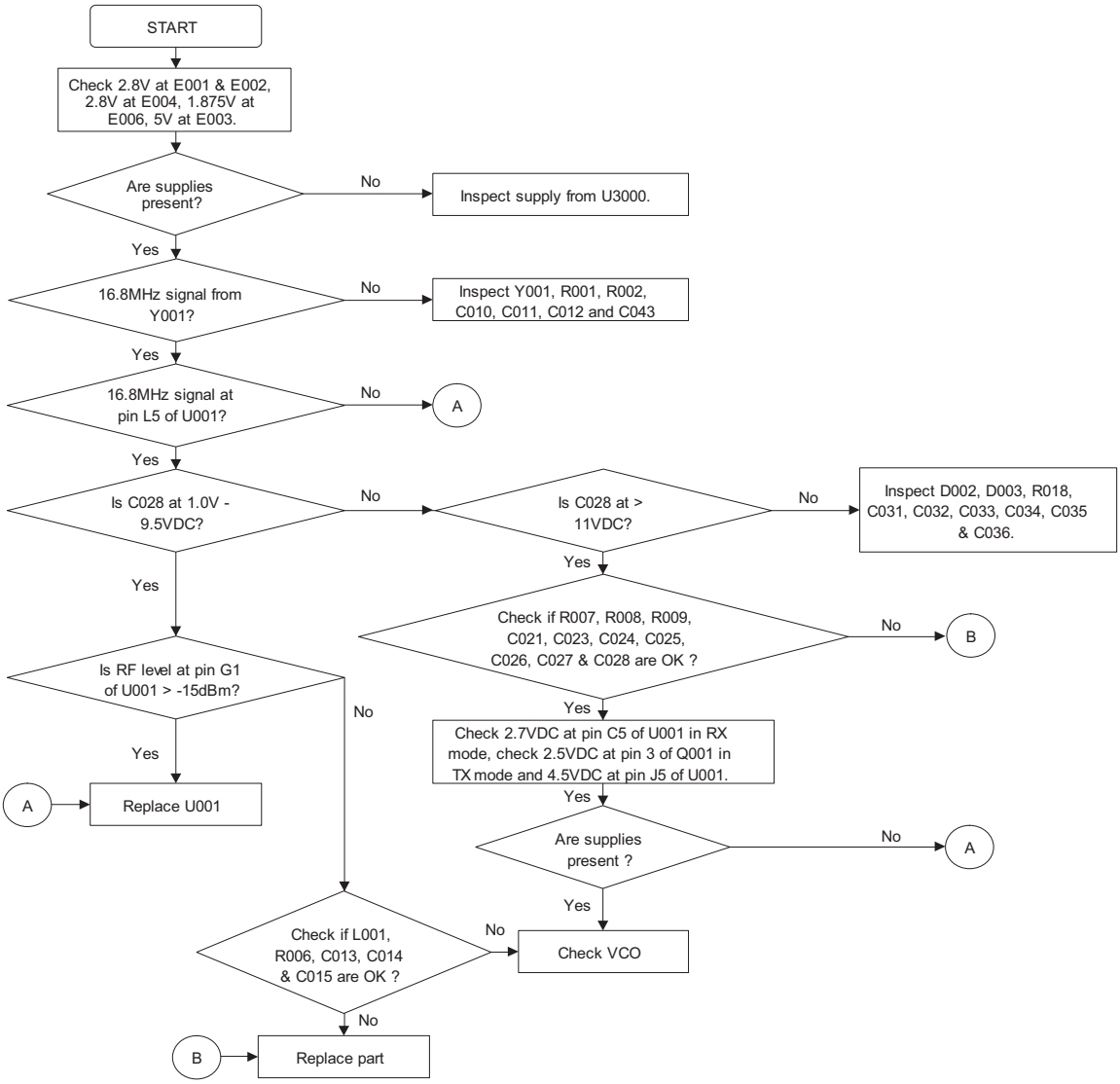
Troubleshooting Flow Chart for Receiver (Sheet 1 of 2)



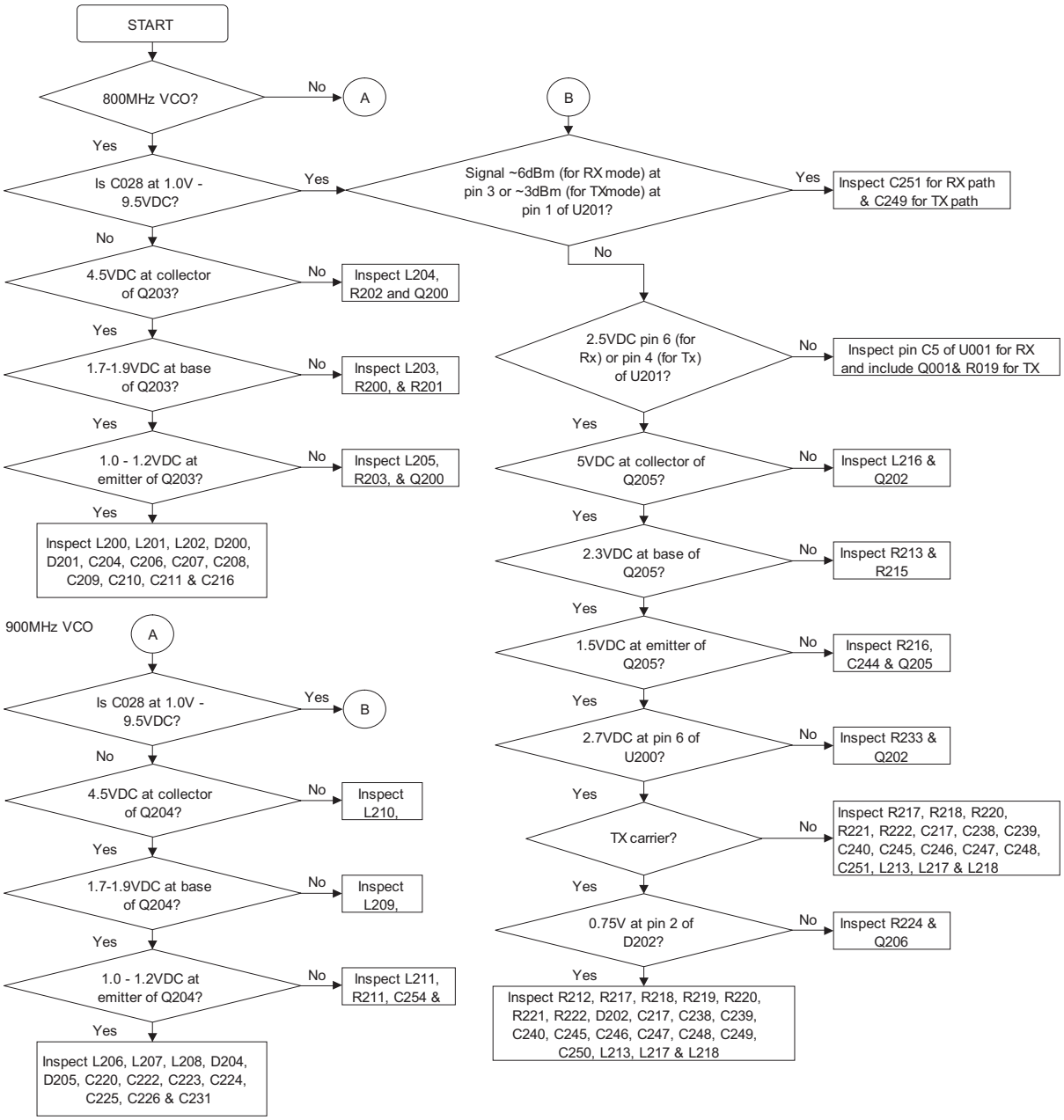
Troubleshooting Flow Chart for Receiver (Sheet 2 of 2)



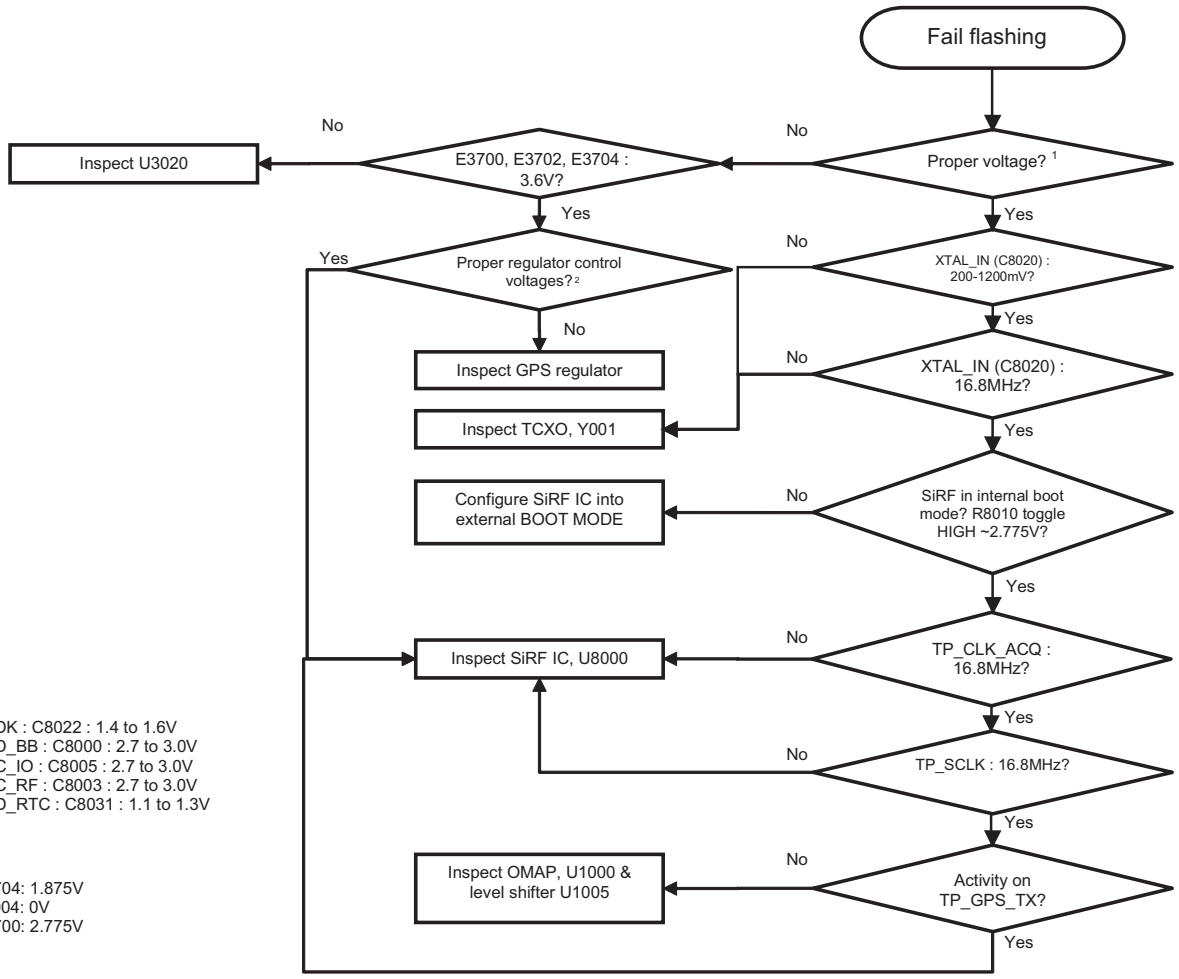
Troubleshooting Flow Chart for Transmitter



Troubleshooting Flow Chart for Synthesizer



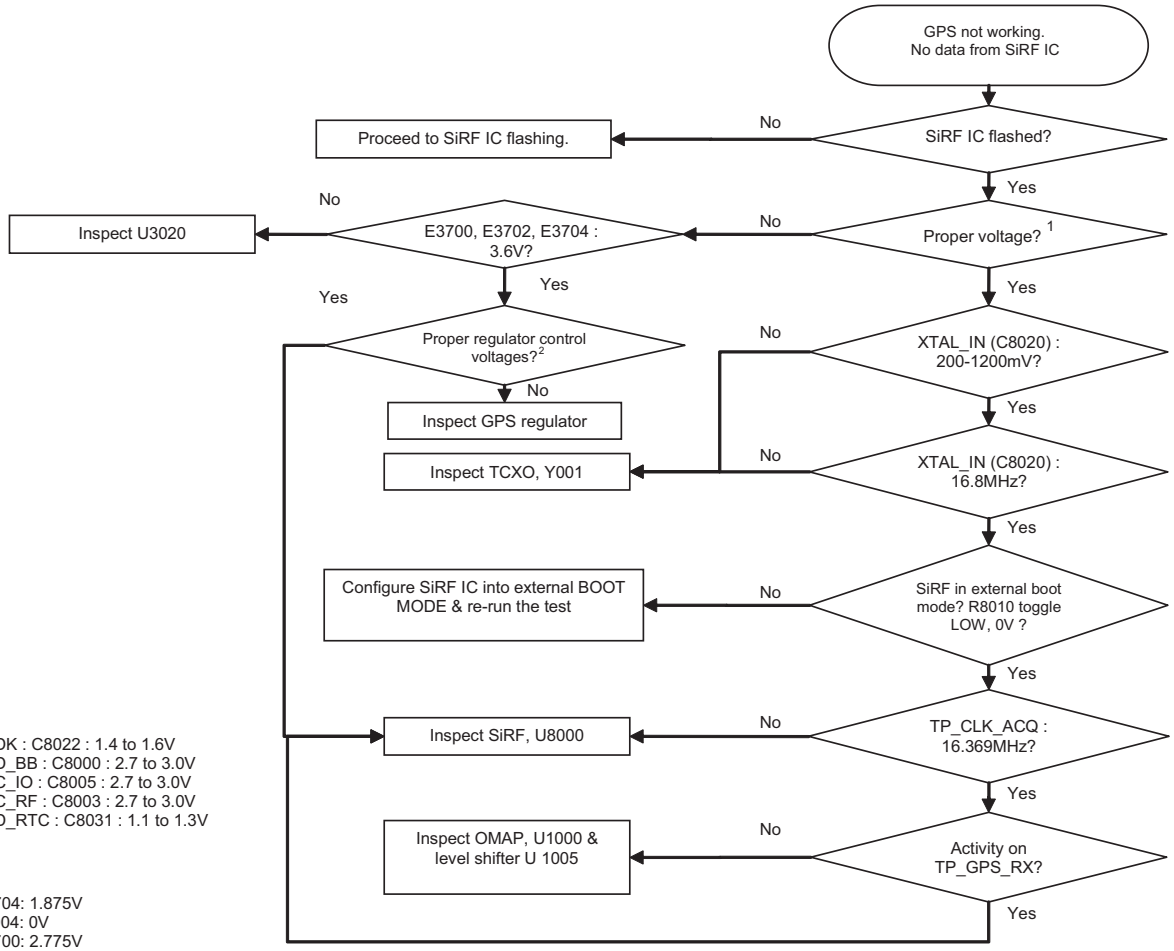
Troubleshooting Flow Chart for VCO



1. VDDK : C8022 : 1.4 to 1.6V
   VDD_BB : C8000 : 2.7 to 3.0V
   VCC_IO : C8005 : 2.7 to 3.0V
   VCC_RF : C8003 : 2.7 to 3.0V
   VDD_RTC : C8031 : 1.1 to 1.3V

2. R3704: 1.875V
   E8004: 0V
   R3700: 2.775V

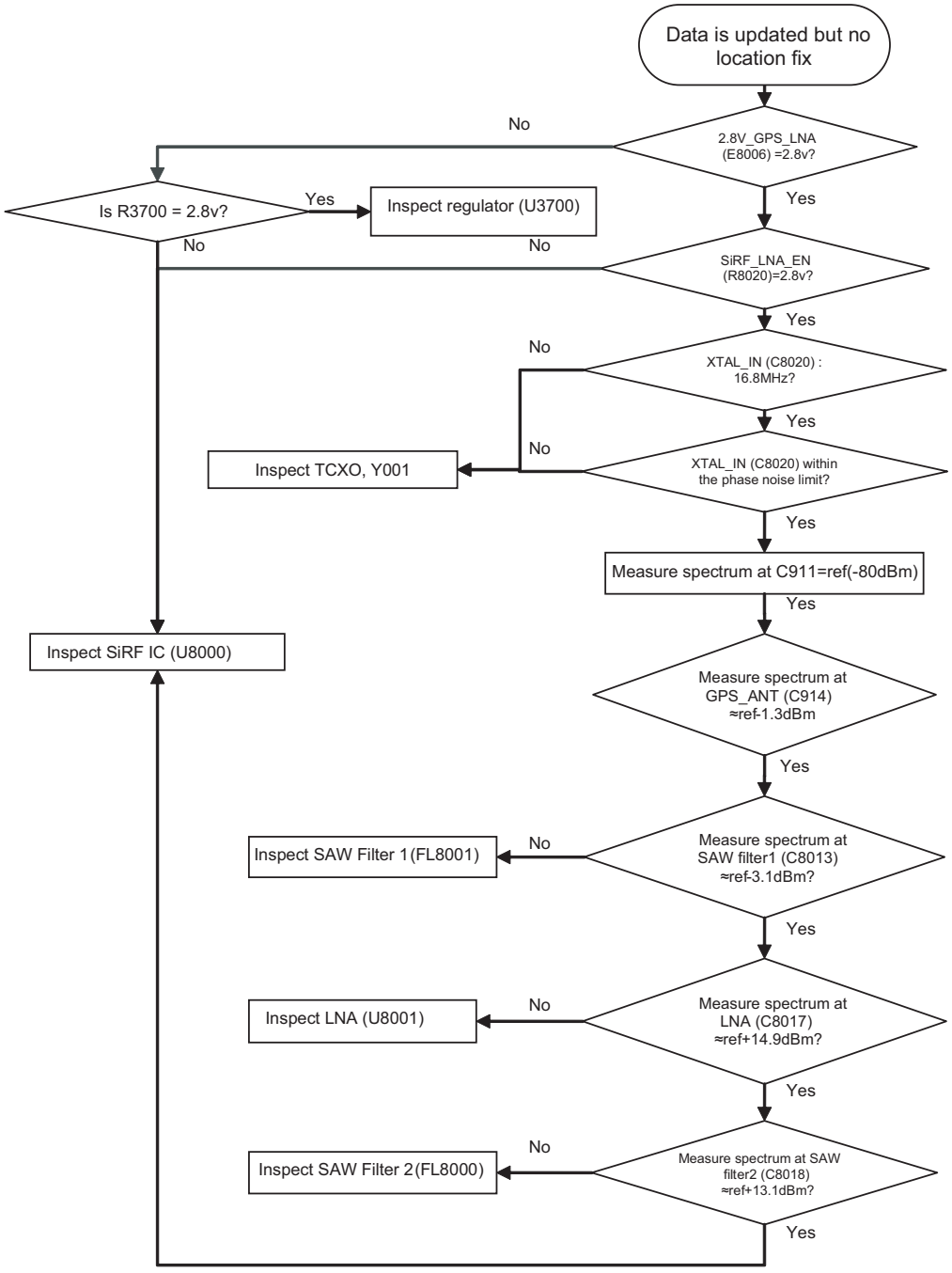
Troubleshooting Flow Chart for GPS Receiver (Sheet 1 of 3)



1. VDDK : C8022 : 1.4 to 1.6V
   VDD_BB : C8000 : 2.7 to 3.0V
   VCC_IO : C8005 : 2.7 to 3.0V
   VCC_RF : C8003 : 2.7 to 3.0V
   VDD_RTC : C8031 : 1.1 to 1.3V

2. R3704: 1.875V
   E8004: 0V
   R3700: 2.775V

Troubleshooting Flow Chart for GPS Receiver (Sheet 2 of 3)



Troubleshooting Flow Chart for GPS Receiver (Sheet 3 of 3)

Section 8

OPTION BOARD INFORMATION

1.0 Option Board

The option board is an interface board between the main RF board and the keypad and Universal Connector. The option board interfaces signals on 40-pin connector on the main board with signals on keypad flex (keypad, side buttons, microphone, backlight control & supply, PTT) and UC flex/ connector of radio side connector (data, USB, accessory device supply, speaker).

The option board also provides test point for each UC signal to allow communication and testing of radio during production testing. Zener diodes are placed on keypad, side buttons, microphone, PTT, data, USB, accessory device supply, speaker, lines for protection of radio from electrostatic discharge (ESD). A transistor is placed here as a switch for backlight LED's for keypad.

2.0 Board Layout/Schematic for Option Board

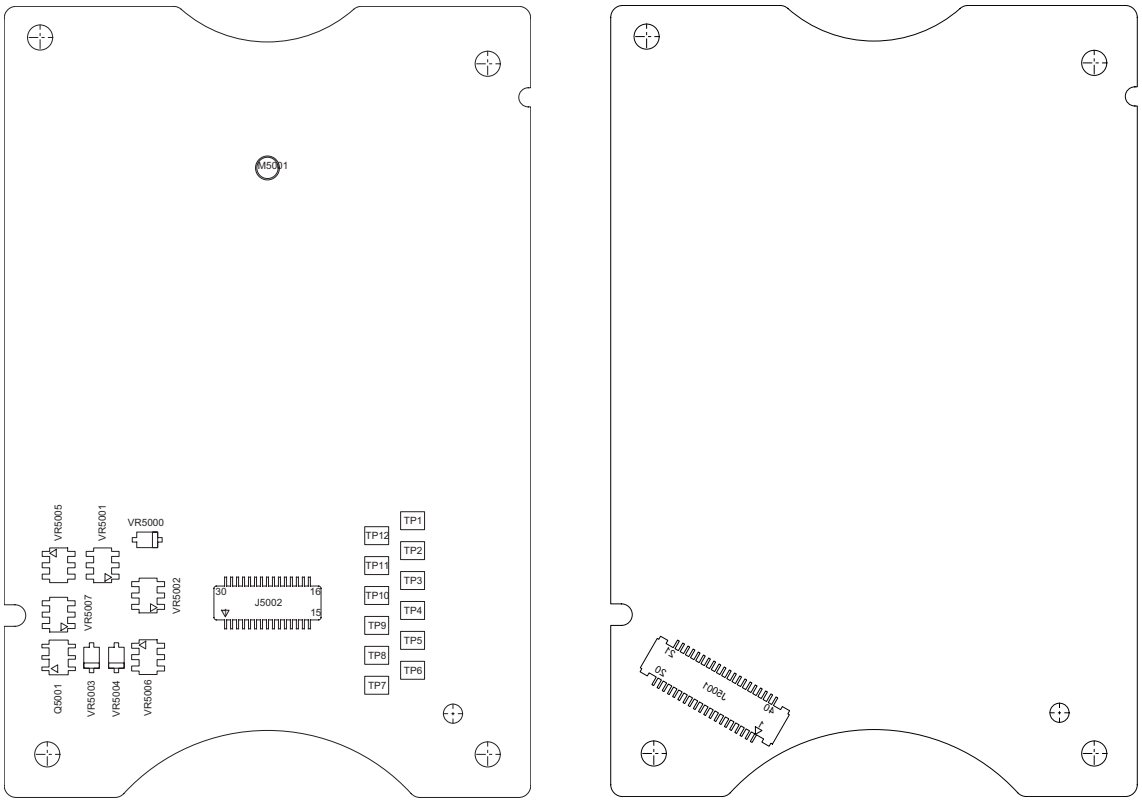


Figure 8-1: Option Board Layout

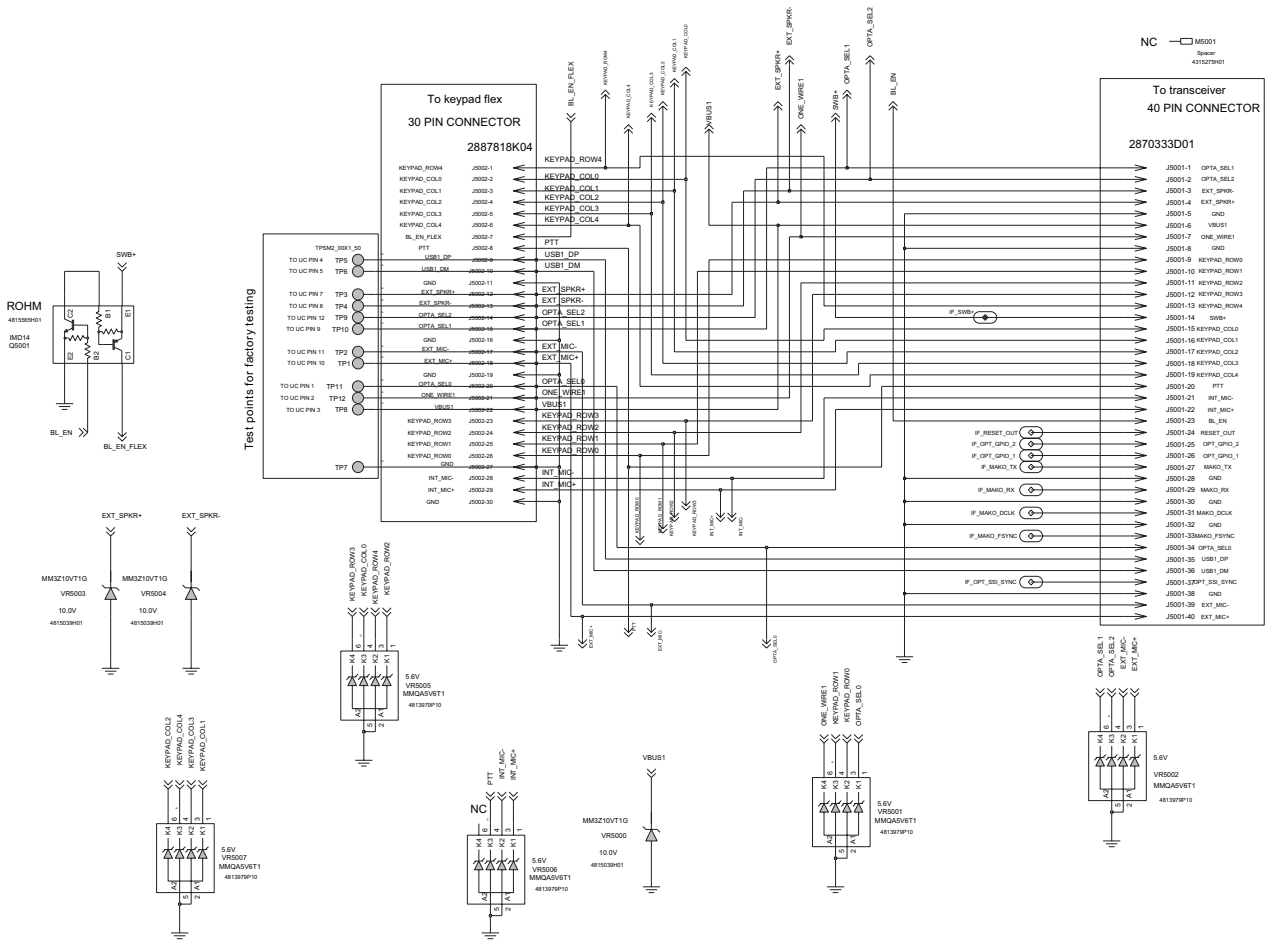


Figure 8-2: Option Board Schematic

2.1 Parts List for Option Board

Reference Symbol	Motorola Part No.	Description
J5002	2887818K04	30 pin board-to-board connector, connector_p
J5001	2871741C01	40 pin board-to-board connector, connector_p
Q5001	4815565H01	ROHM IMD14 transistor
VR5001	4813979P10	MMQA5V6T1
VR5002	4813979P10	MMQA5V6T1
VR5005	4813979P10	MMQA5V6T1
VR5006	4813979P10	MMQA5V6T1
VR5007	4813979P10	MMQA5V6T1
VR5003	4815040H01	MM3Z12VT1G
VR5004	4815040H01	MM3Z12VT1G
VR5000	4815040H01	MM3Z12VT1G
M5001	4315275H01	Spacer

Appendix A Replacement Parts Ordering

1.0 Basic Ordering Information

When ordering replacement parts or equipment information, the complete identification number should be included. This applies to all components, kits, and chassis. If the component part number is not known, the order should include the number of the chassis or kit of which it is a part, and sufficient description of the desired component to identify it.

2.0 Motorola Online

Motorola Online users can access our online catalog at

https://www.motorola.com/businessonline

To register for online access, please call 800-422-4210 (for U.S. and Canada Service Centers only). International customers can obtain assistance at https://www.motorola.com/businessonline

3.0 Mail Orders

Mail orders are only accepted by the US Federal Government Markets Division (USFGMD).

Motorola
7031 Columbia Gateway Drive
3rd Floor - Order Processing
Columbia, MD 21046
U.S.A.

4.0 Telephone Orders

The Radio Products and Solutions Organization*
(United States and Canada)
7:00 AM to 7:00 PM (Central Standard Time)
Monday through Friday (Chicago, U.S.A.)
1-800-422-4210
1-847-538-8023 (United States and Canada)

U.S. Federal Government Markets Division (USFGMD)
1-800-826-1913 Federal Government Parts - Credit Cards Only
8:30 AM to 5:00 PM (Eastern Standard Time)

5.0 Fax Orders

The Radio Products and Solutions Organization*
(United States and Canada)
1-800-622-6210
847-576-3023 (United States and Canada)

USFGMD
(Federal Government Orders)
1-800-526-8641 (For Parts and Equipment Purchase Orders)

6.0 Parts Identification

The Radio Products and Solutions Organization*
(United States and Canada)
1-800-422-4210

7.0 Product Customer Service

Radio Products and Solutions Organization (United States and Canada)
1-800-927-2744

* The Motorola Radio Products and Solutions Organization (RPSO) was formerly known as the Radio Products Services Division (RPSD) and/or the Accessories and Aftermarket Division (AAD).

Appendix B Motorola Service Centers

1.0 Servicing Information

If a unit requires further testing, knowledge and/or details of component level troubleshooting or service than is customarily performed at the basic level, please send the radio to a Motorola Service Center as listed below.

2.0 Motorola Service Center

45D Butterfield Trail
El Paso, TX 79906

Tel: 1-800-227-6772

3.0 Motorola Canadian Technical Logistics Center

Motorola Canada Ltd.
8133 Warden Avenue
Markham, Ontario, L6G 1B3

Tel: 800-543-3222
Fax: 888-331-9872 / 905-948-5970

4.0 Motorola Federal Technical Center

4395 Nicole Drive
Lanham, MD 20706

Tel: 800-969-6680
Fax: 800-784-4113

Notes

Glossary

This glossary contains an alphabetical listing of terms and their definitions that are applicable to portable and mobile subscriber radio products. All terms do not necessarily apply to all radios, and some terms are merely generic in nature.

Term	Definition
Analog	Refers to a continuously variable signal or a circuit or device designed to handle such signals.
Band	Frequencies allowed for a specific purpose.
CPS	Customer Programming Software: Software with a graphical user interface containing the feature set of a radio.
Default	A pre-defined set of parameters.
Digital	Refers to data that is stored or transmitted as a sequence of discrete symbols from a finite set; most commonly this means binary data represented using electronic or electromagnetic signals.
DPL	Digital Private-Line: A type of digital communications that utilizes privacy call, as well as memory channel and busy channel lock out to enhance communication efficiency.
FCC	Federal Communications Commission.
Frequency	Number of times a complete electromagnetic-wave cycle occurs in a fixed unit of time (usually one second).
GPIO	General-Purpose Input/Output: Pins whose function is programmable.
GPS	Global Positioning System
IC	Integrated Circuit: An assembly of interconnected components on a small semiconductor chip, usually made of silicon. One chip can contain millions of microscopic components and perform many functions.
IF	Intermediate Frequency.
kHz	kilohertz: One thousand cycles per second. Used especially as a radio-frequency unit.
LCD	Liquid-Crystal Display: An LCD uses two sheets of polarizing material with a liquid-crystal solution between them. An electric current passed through the liquid causes the crystals to align so that light cannot pass through them.
LED	Light Emitting Diode: An electronic device that lights up when electricity is passed through it.
MDC	Motorola Digital Communications.

Term	Definition
MHz	Megahertz: One million cycles per second. Used especially as a radio-frequency unit.
Paging	One-way communication that alerts the receiver to retrieve a message.
PC Board	Printed Circuit Board. Also referred to as a PCB.
PL	Private-Line Tone Squelch: A continuous sub-audible tone that is transmitted along with the carrier.
Programming Cable	A cable that allows the CPS to communicate directly with the radio using USB.
Receiver	Electronic device that amplifies RF signals. A receiver separates the audio signal from the RF carrier, amplifies it, and converts it back to the original sound waves.
Repeater	Remote transmit/receive facility that re-transmits received signals in order to improve communications range and coverage (conventional operation).
RF	Radio Frequency: The portion of the electromagnetic spectrum between audio sound and infrared light (approximately 10 kHz to 10 GHz).
RX	Receive.
Signal	An electrically transmitted electromagnetic wave.
Spectrum	Frequency range within which radiation has specific characteristics.
Squelch	Muting of audio circuits when received signal levels fall below a pre-determined value. With carrier squelch, all channel activity that exceeds the radio’s preset squelch level can be heard.
TOT	Time-out Timer: A timer that limits the length of a transmission.
TPL	Tone Private Line
Transceiver	Transmitter-receiver. A device that both transmits and receives analog or digital signals. Also abbreviated as XCVR.
Transmitter	Electronic equipment that generates and amplifies an RF carrier signal, modulates the signal, and then radiates it into space.
TX	Transmit.
UHF	Ultra-High Frequency.
USB	Universal Serial Bus: An external bus standard that supports data transfer rates of 12 Mbps.
VIP	Vehicle Interface Port.
XPR	Refers to Digital Professional Radio model names in the MOTOTRBO Professional Digital Two-Way Radio System.

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